FIG. 1(a)

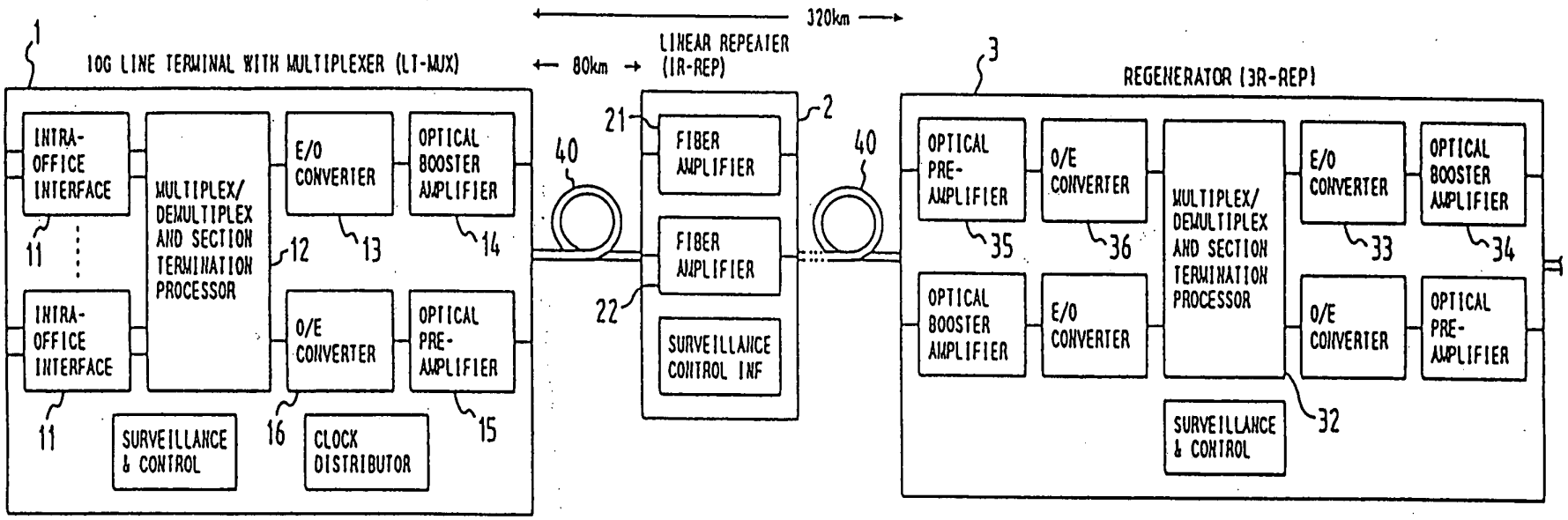

320km
80km
1
10G LINE TERMINAL WITH MULTIPLEXER (LT-MUX)
LINEAR REPEATER (IR-REP)
3
REGENERATOR (3R-REP)
INTRA-OFFICE INTERFACE
INTRA-OFFICE INTERFACE
MULTIPLEX/ DEMULTIPLEX AND SECTION TERMINATION PROCESSOR
E/O CONVERTER
O/E CONVERTER
OPTICAL BOOSTER AMPLIFIER
OPTICAL PRE-AMPLIFIER
SURVEILLANCE & CONTROL
CLOCK DISTRIBUTOR
11
12
13
14
15
16
40
21
22
2
FIBER AMPLIFIER
FIBER AMPLIFIER
SURVEILLANCE CONTROL INF
OPTICAL PRE-AMPLIFIER
O/E CONVERTER
OPTICAL BOOSTER AMPLIFIER
E/O CONVERTER
MULTIPLEX/ DEMULTIPLEX AND SECTION TERMINATION PROCESSOR
SURVEILLANCE & CONTROL
E/O CONVERTER
O/E CONVERTER
OPTICAL BOOSTER AMPLIFIER
OPTICAL PRE-AMPLIFIER
35
36
33
34
32

FIG. 1(b)

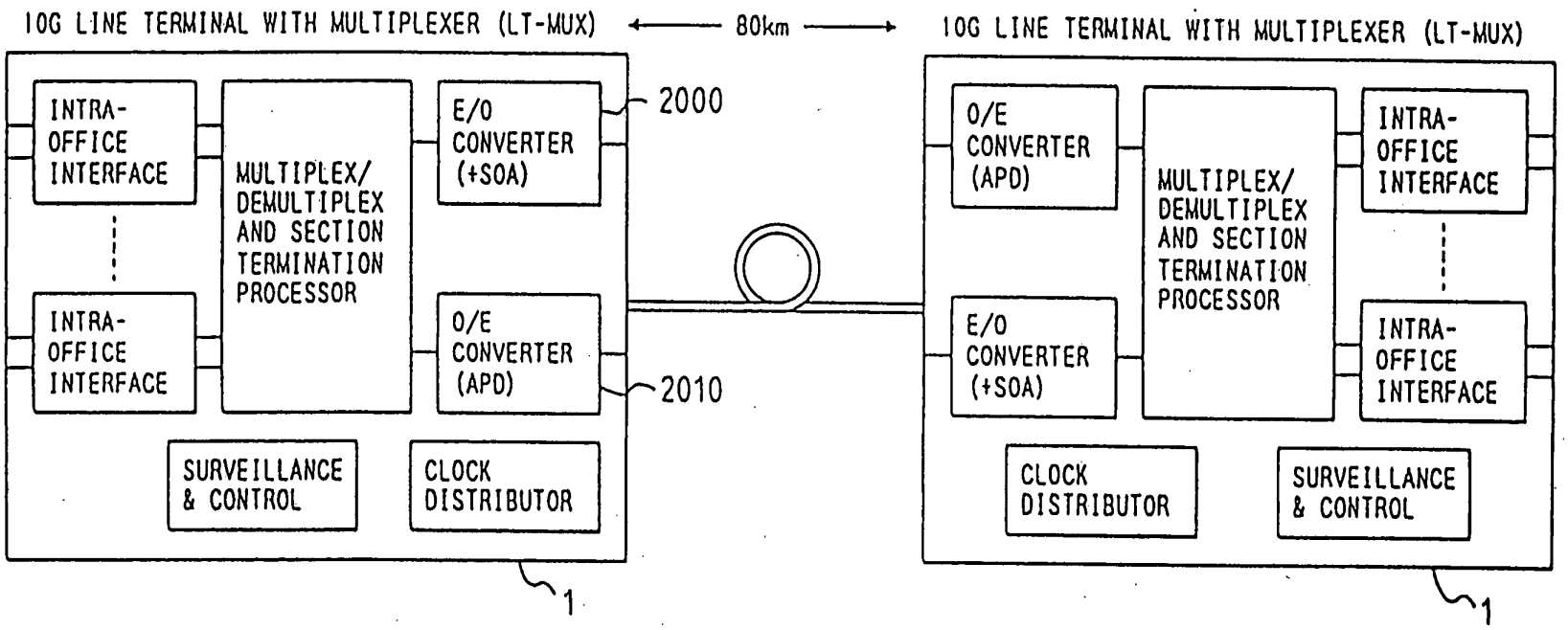
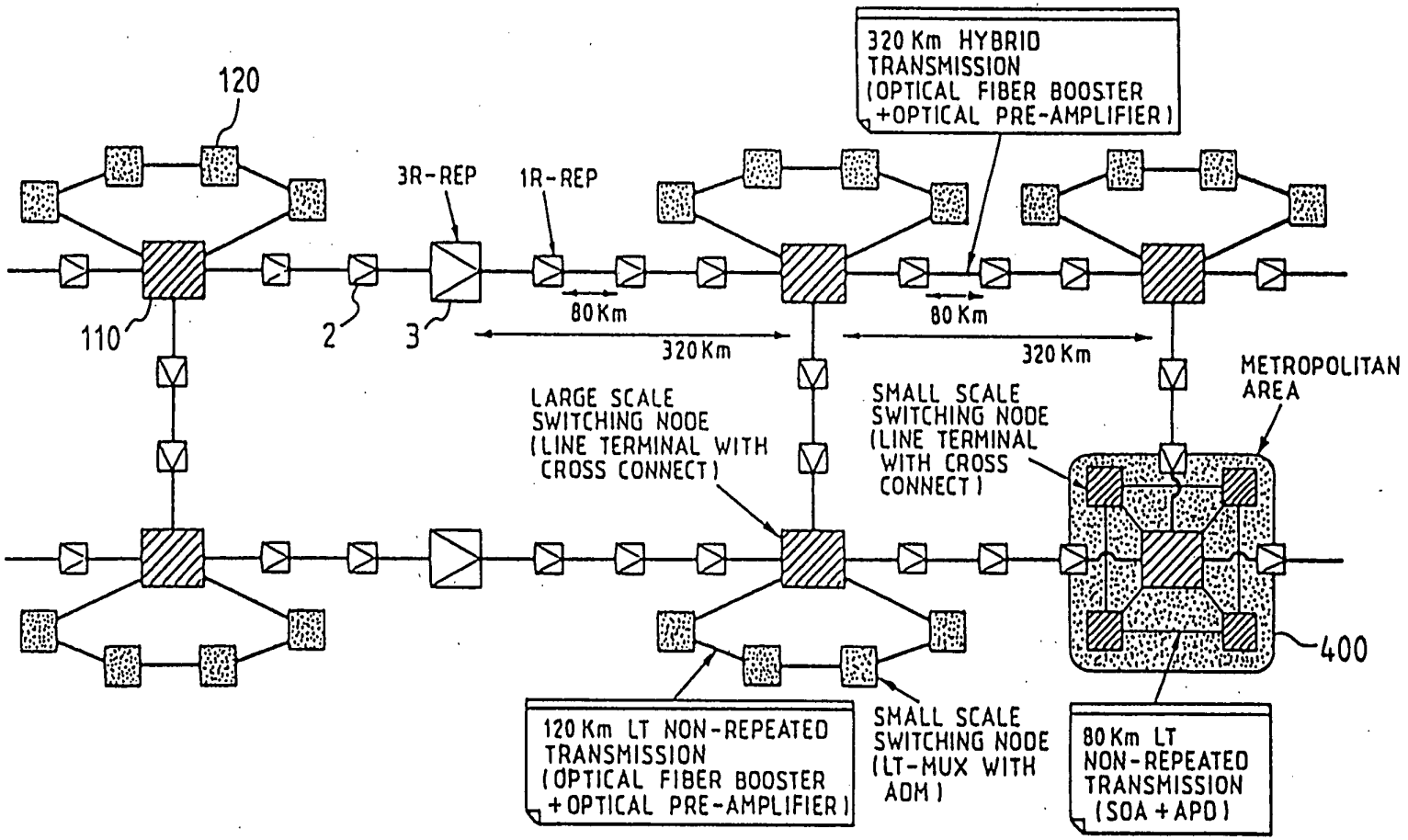

10G LINE TERMINAL WITH MULTIPLEXER (LT-MUX)
80km
10G LINE TERMINAL WITH MULTIPLEXER (LT-MUX)
INTRA-OFFICE INTERFACE
INTRA-OFFICE INTERFACE
MULTIPLEX/ DEMULTIPLEX AND SECTION TERMINATION PROCESSOR
E/O CONVERTER (+SOA)
O/E CONVERTER (APD)
2000
2010
SURVEILLANCE & CONTROL
CLOCK DISTRIBUTOR
O/E CONVERTER (APD)
E/O CONVERTER (+SOA)
MULTIPLEX/ DEMULTIPLEX AND SECTION TERMINATION PROCESSOR
INTRA-OFFICE INTERFACE
INTRA-OFFICE INTERFACE
CLOCK DISTRIBUTOR
SURVEILLANCE & CONTROL
1
1

FIG. 2


120
3R-REP
1R-REP
320 Km HYBRID
TRANSMISSION
(OPTICAL FIBER BOOSTER
+OPTICAL PRE-AMPLIFIER)
110
2
3
80 Km
320 Km
80 Km
320 Km
METROPOLITAN
AREA
LARGE SCALE
SWITCHING NODE
(LINE TERMINAL WITH
CROSS CONNECT)
SMALL SCALE
SWITCHING NODE
(LINE TERMINAL
WITH CROSS
CONNECT)
400
120 Km LT NON-REPEATED
TRANSMISSION
(OPTICAL FIBER BOOSTER
+OPTICAL PRE-AMPLIFIER)
SMALL SCALE
SWITCHING NODE
(LT-MUX WITH
ADM)
80 Km LT
NON-REPEATED
TRANSMISSION
(SOA + APD)

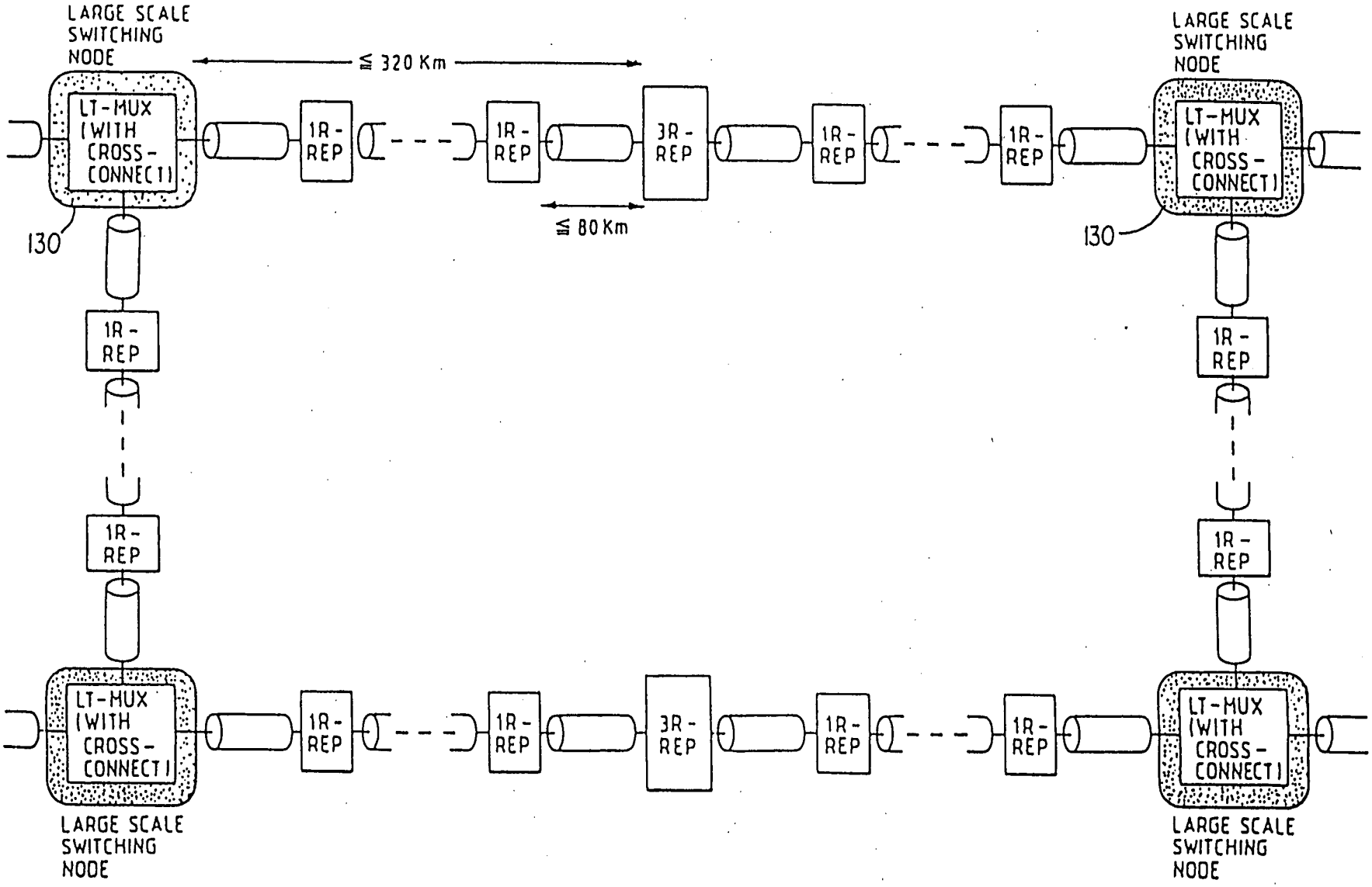

LARGE SCALE SWITCHING NODE
≦ 320 Km
LT-MUX (WITH CROSS-CONNECT)
1R-REP
3R-REP
≦ 80 Km
130
LARGE SCALE SWITCHING NODE
LT-MUX (WITH CROSS-CONNECT)
130
1R-REP
1R-REP
1R-REP
1R-REP
LT-MUX (WITH CROSS-CONNECT)
1R-REP
1R-REP
3R-REP
1R-REP
1R-REP
LT-MUX (WITH CROSS-CONNECT)
LARGE SCALE SWITCHING NODE
LARGE SCALE SWITCHING NODE

FIG. 3

FIG. 4

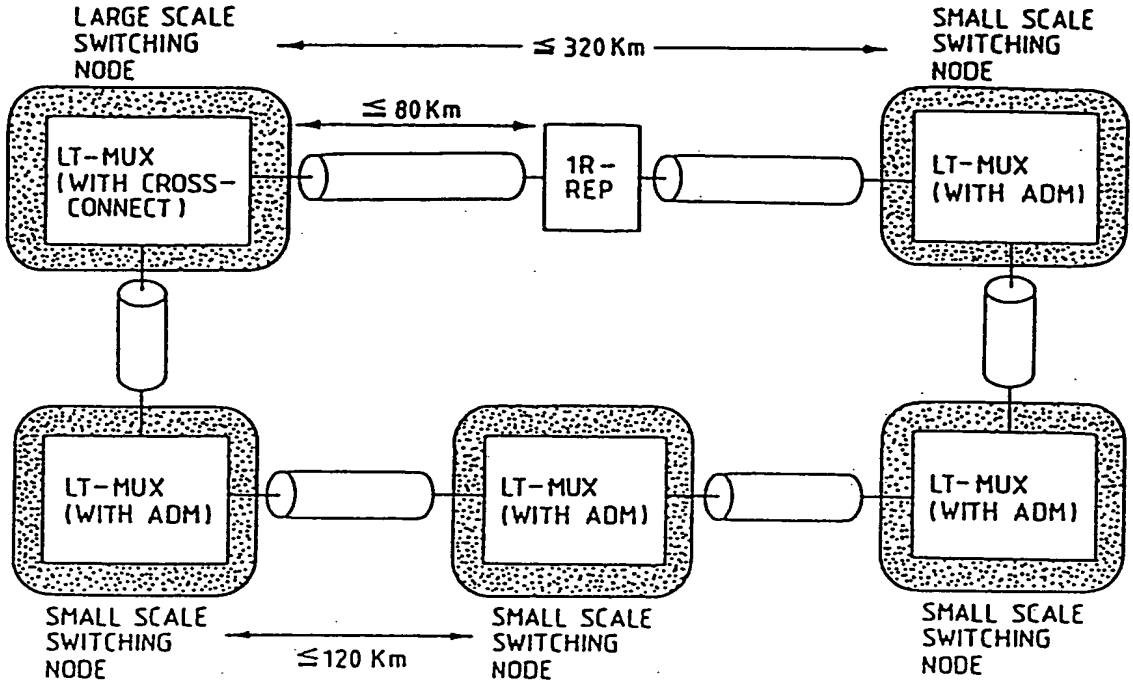

LARGE SCALE SWITCHING NODE
≦ 320 Km
SMALL SCALE SWITCHING NODE
≦ 80 Km
LT-MUX (WITH CROSS-CONNECT)
1R-REP
LT-MUX (WITH ADM)
LT-MUX (WITH ADM)
LT-MUX (WITH ADM)
LT-MUX (WITH ADM)
SMALL SCALE SWITCHING NODE
≦120 Km
SMALL SCALE SWITCHING NODE
SMALL SCALE SWITCHING NODE

FIG. 5

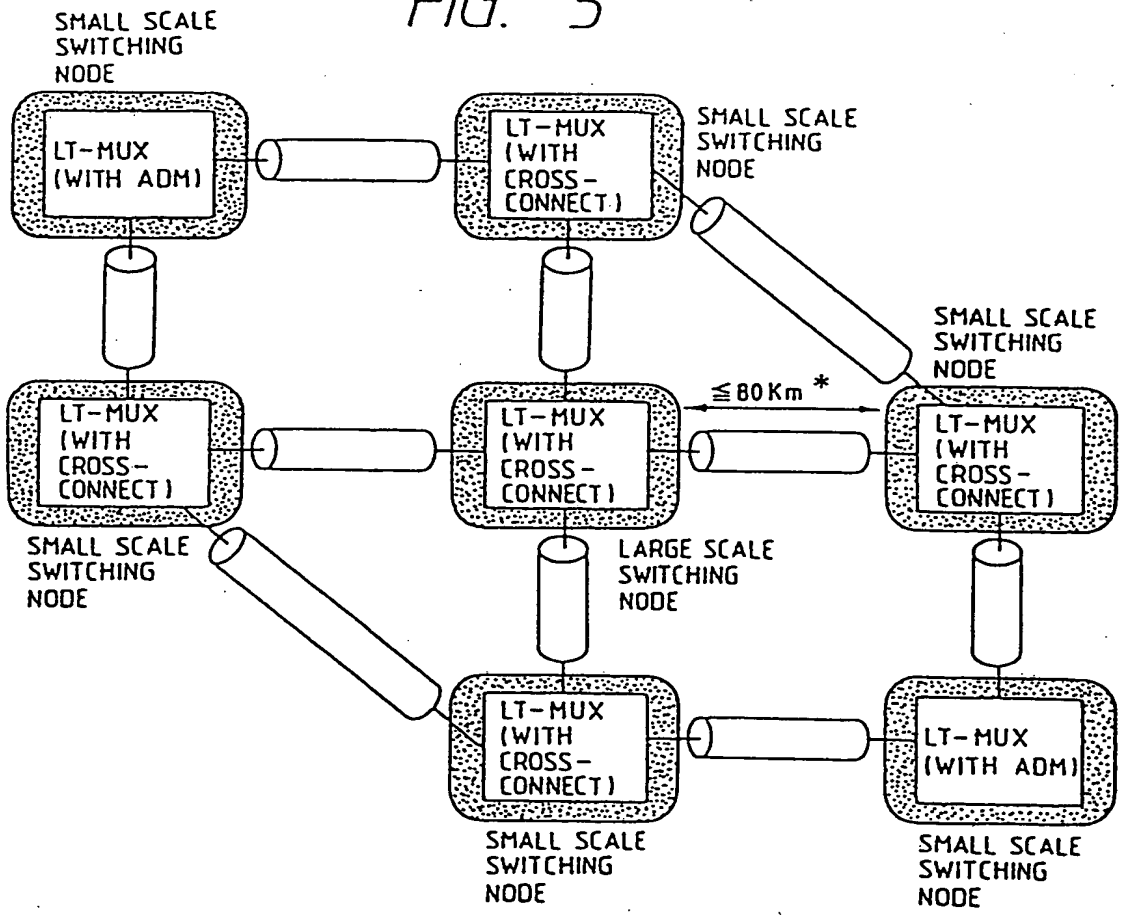

SMALL SCALE SWITCHING NODE
LT-MUX (WITH ADM)
LT-MUX (WITH CROSS-CONNECT)
SMALL SCALE SWITCHING NODE
SMALL SCALE SWITCHING NODE
≦80 Km *
LT-MUX (WITH CROSS-CONNECT)
LT-MUX (WITH CROSS-CONNECT)
LT-MUX (WITH CROSS-CONNECT)
SMALL SCALE SWITCHING NODE
LARGE SCALE SWITCHING NODE
LT-MUX (WITH CROSS-CONNECT)
LT-MUX (WITH ADM)
SMALL SCALE SWITCHING NODE
SMALL SCALE SWITCHING NODE

FIG. 6(a)

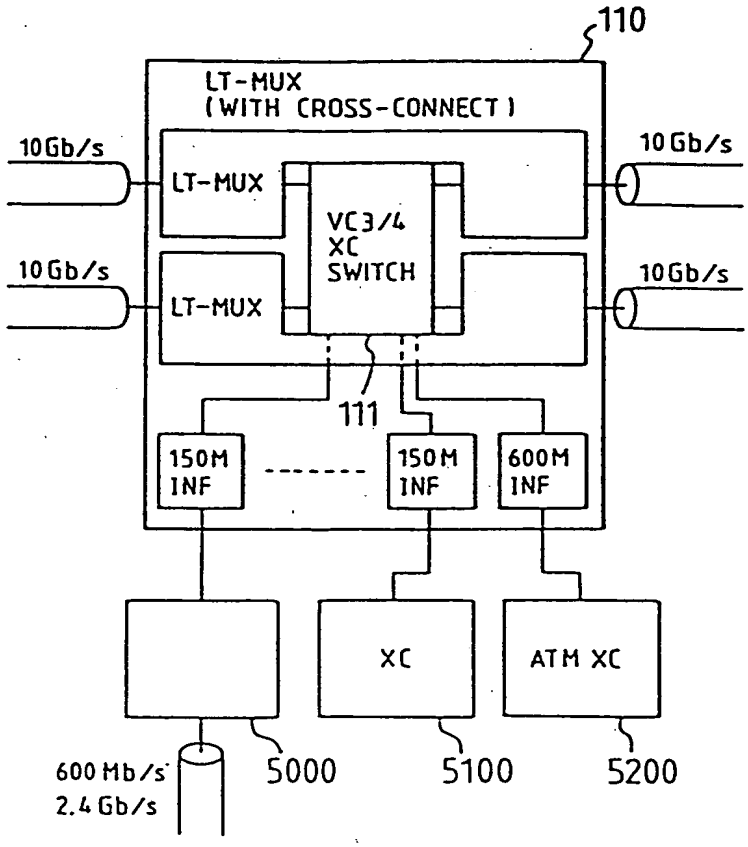

110
LT-MUX
(WITH CROSS-CONNECT)
10Gb/s
10Gb/s
LT-MUX
VC3/4
XC
SWITCH
10Gb/s
10Gb/s
LT-MUX
111
150M
INF
150M
INF
600M
INF
XC
ATM XC
600Mb/s
2.4Gb/s
5000
5100
5200

FIG. 6(b)

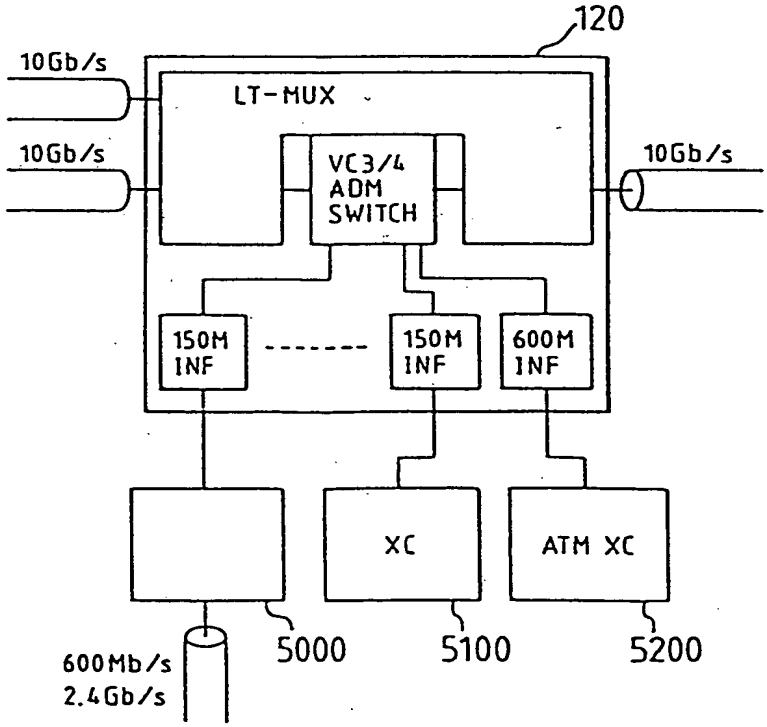

120
10Gb/s
LT-MUX
10Gb/s
VC3/4
ADM
SWITCH
10Gb/s
150M
INF
150M
INF
600M
INF
XC
ATM XC
600Mb/s
2.4Gb/s
5000
5100
5200

FIG. 7

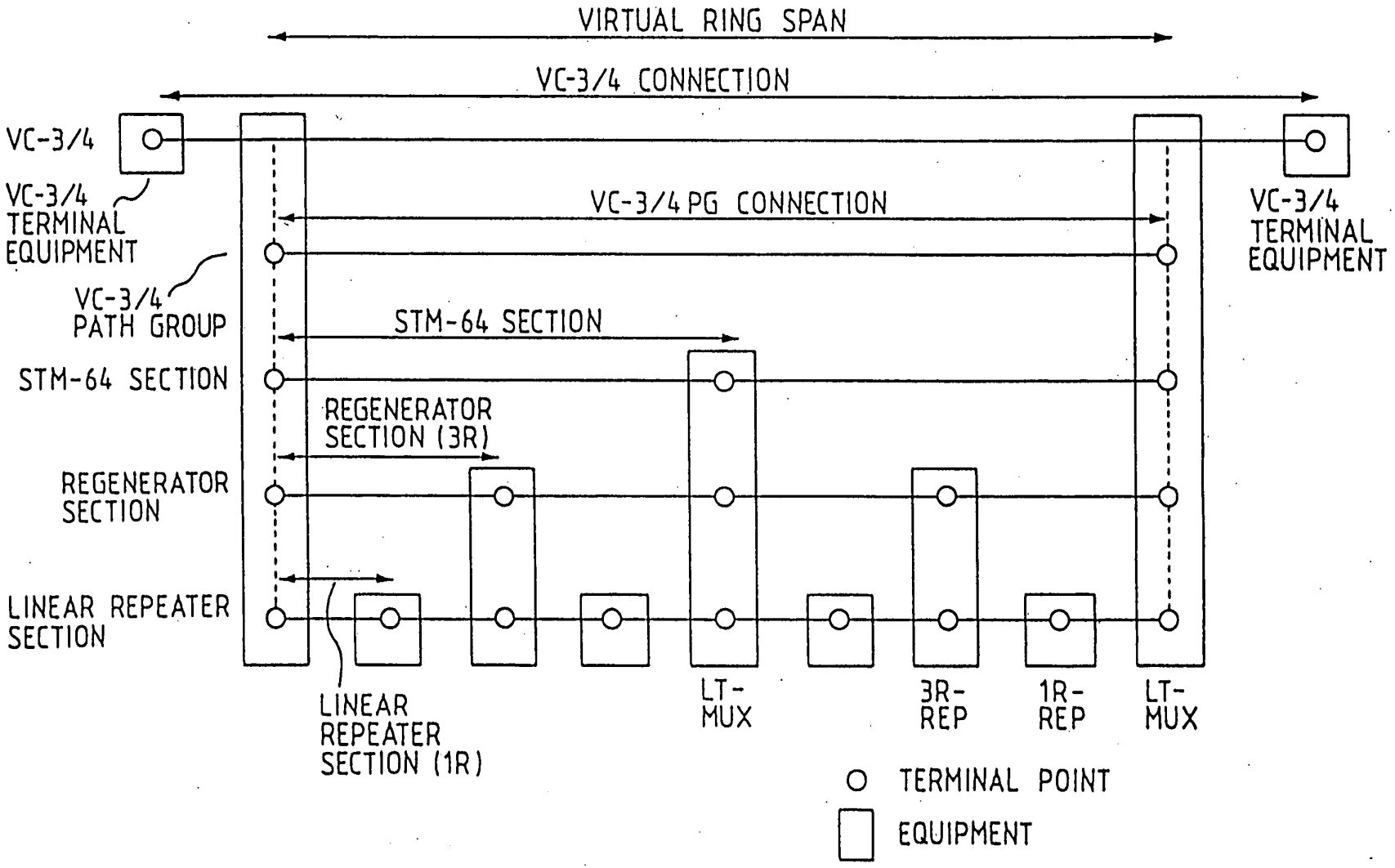

VIRTUAL RING SPAN
VC-3/4 CONNECTION
VC-3/4
VC-3/4 TERMINAL EQUIPMENT
VC-3/4 PG CONNECTION
VC-3/4 TERMINAL EQUIPMENT
VC-3/4 PATH GROUP
STM-64 SECTION
STM-64 SECTION
REGENERATOR SECTION (3R)
REGENERATOR SECTION
LINEAR REPEATER SECTION
LINEAR REPEATER SECTION (1R)
LT-MUX
3R-REP
1R-REP
LT-MUX
TERMINAL POINT
EQUIPMENT

FIG. 8

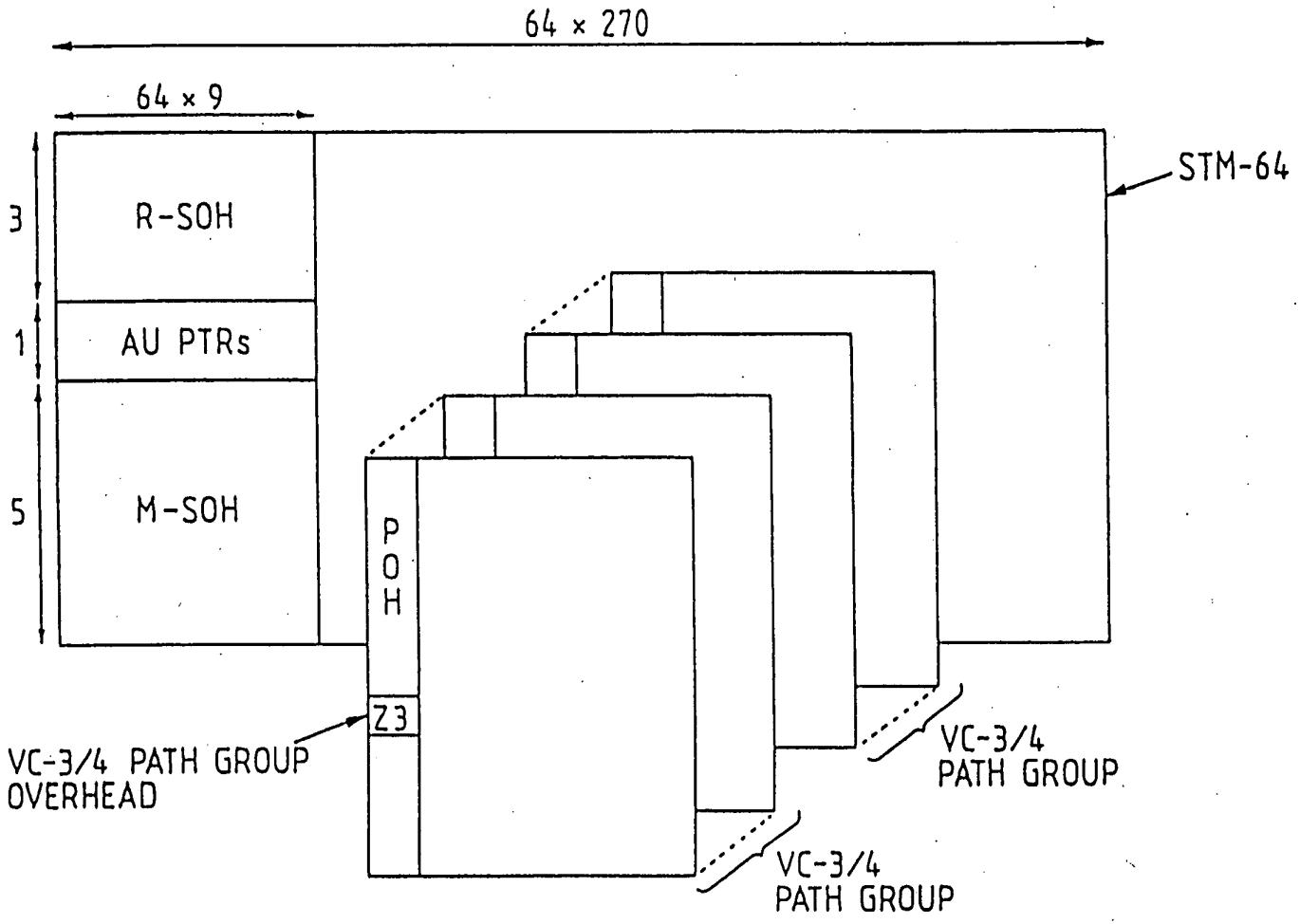

64 × 270
64 × 9
3
R-SOH
1
AU PTRs
5
M-SOH
STM-64
P
O
H
Z3
VC-3/4 PATH GROUP
OVERHEAD
VC-3/4
PATH GROUP
VC-3/4
PATH GROUP

FIG. 9

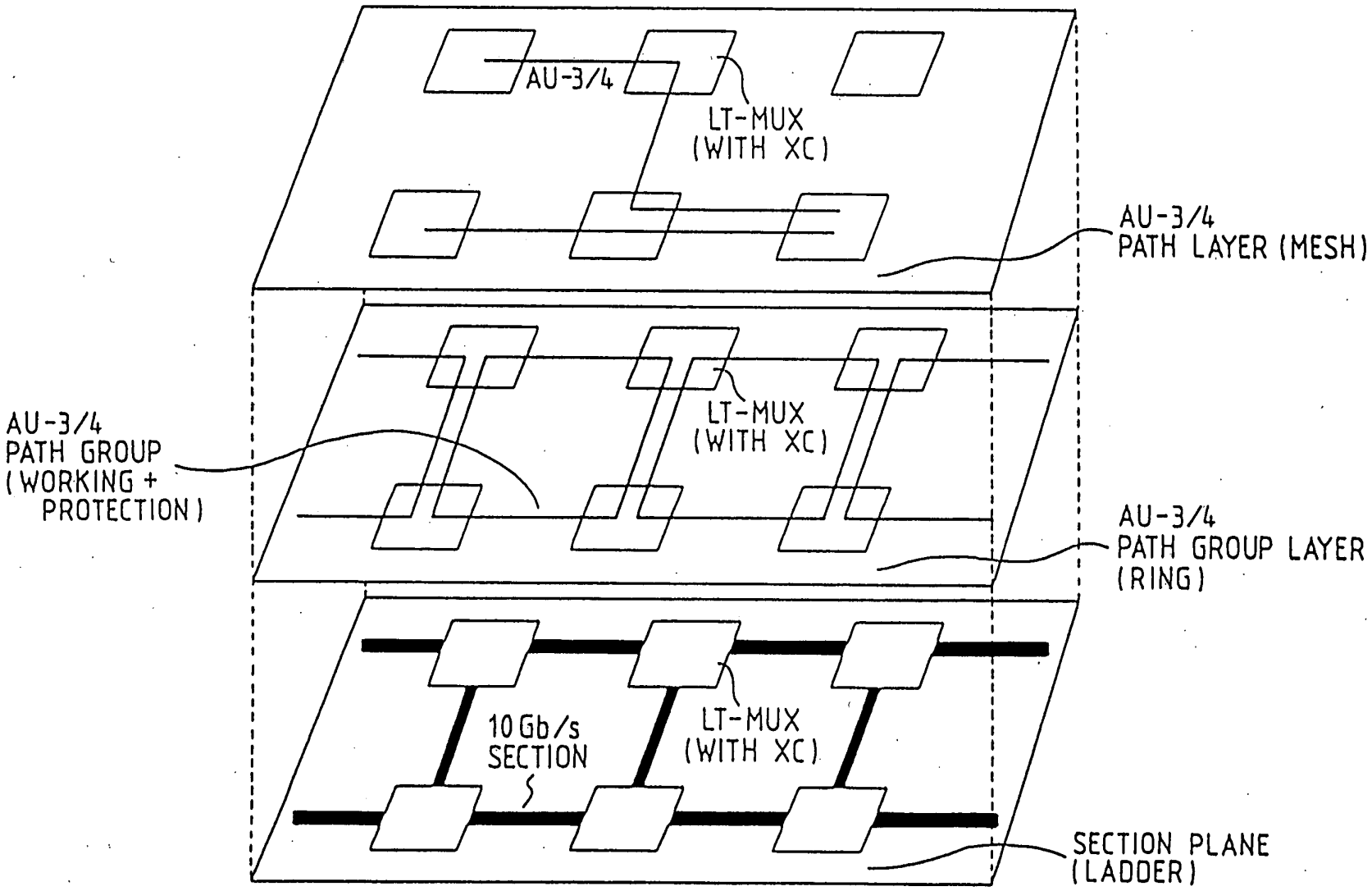

AU-3/4
LT-MUX
(WITH XC)
AU-3/4
PATH LAYER (MESH)
AU-3/4
PATH GROUP
(WORKING +
PROTECTION)
LT-MUX
(WITH XC)
AU-3/4
PATH GROUP LAYER
(RING)
10 Gb/s
SECTION
LT-MUX
(WITH XC)
SECTION PLANE
(LADDER)

FIG. 10

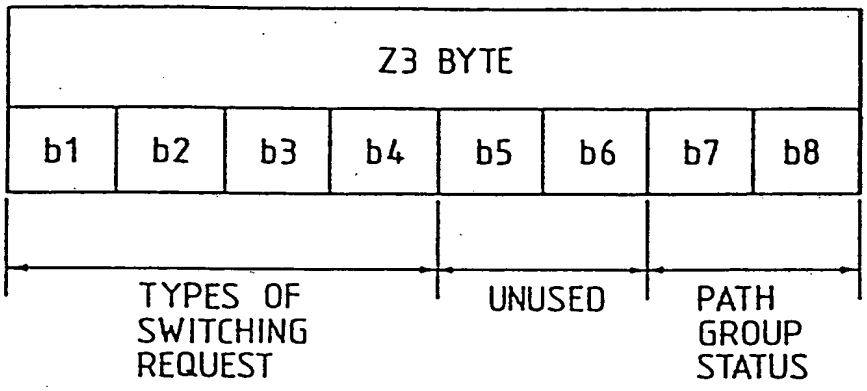

Z3 BYTE
b1
b2
b3
b4
b5
b6
b7
b8
TYPES OF SWITCHING REQUEST
UNUSED
PATH GROUP STATUS

FIG. 11

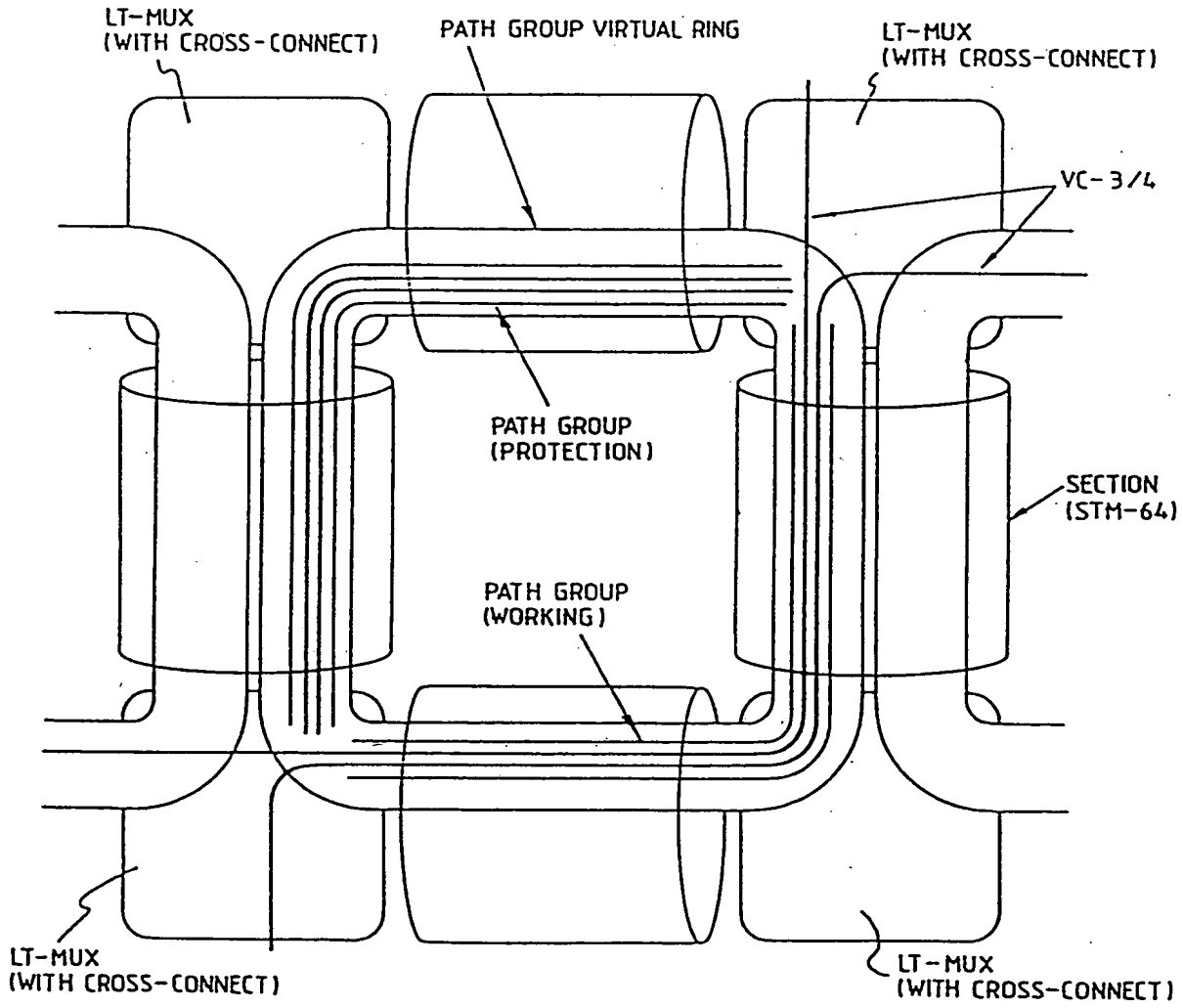

LT-MUX (WITH CROSS-CONNECT)
PATH GROUP VIRTUAL RING
LT-MUX (WITH CROSS-CONNECT)
VC-3/4
PATH GROUP (PROTECTION)
SECTION (STM-64)
PATH GROUP (WORKING)
LT-MUX (WITH CROSS-CONNECT)
LT-MUX (WITH CROSS-CONNECT)

FIG. 12

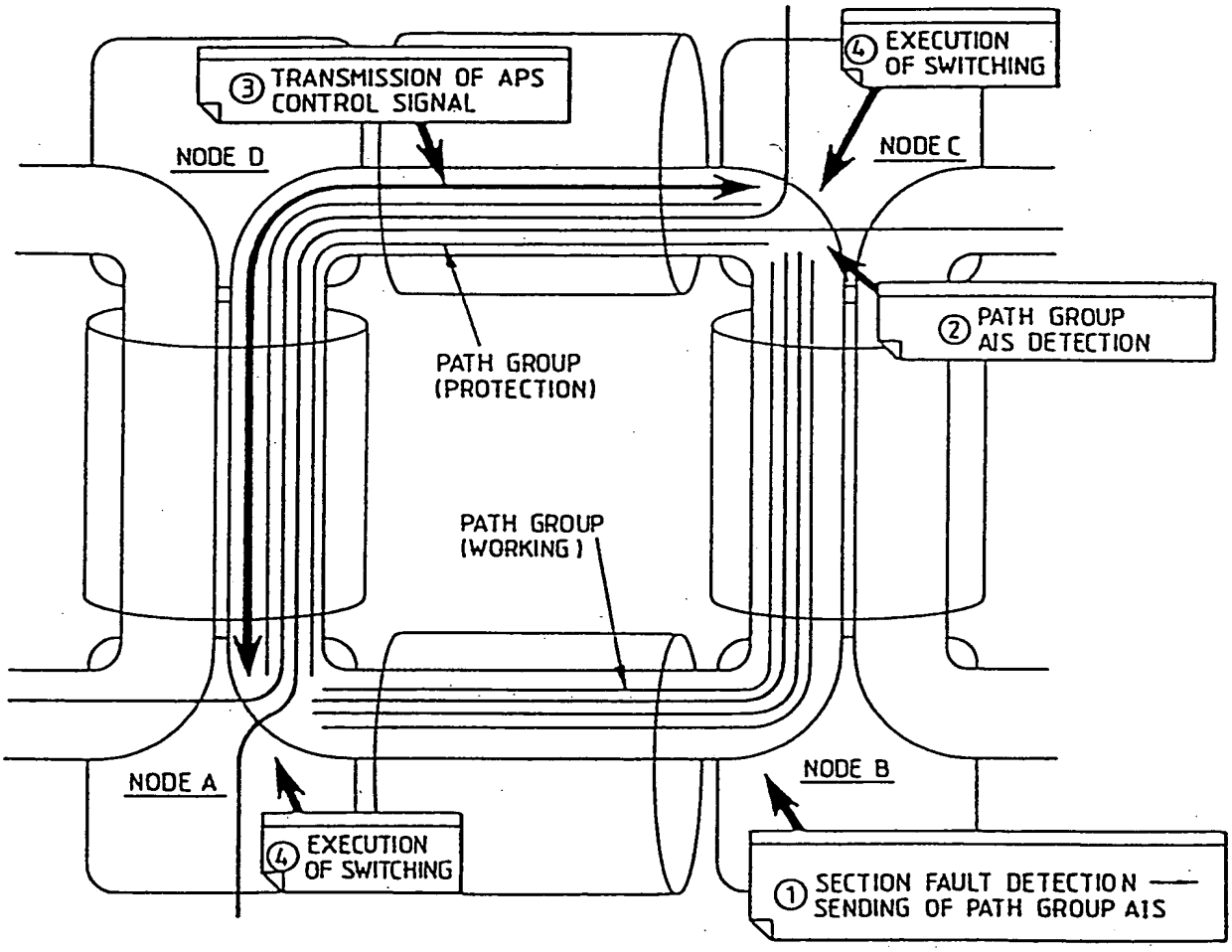
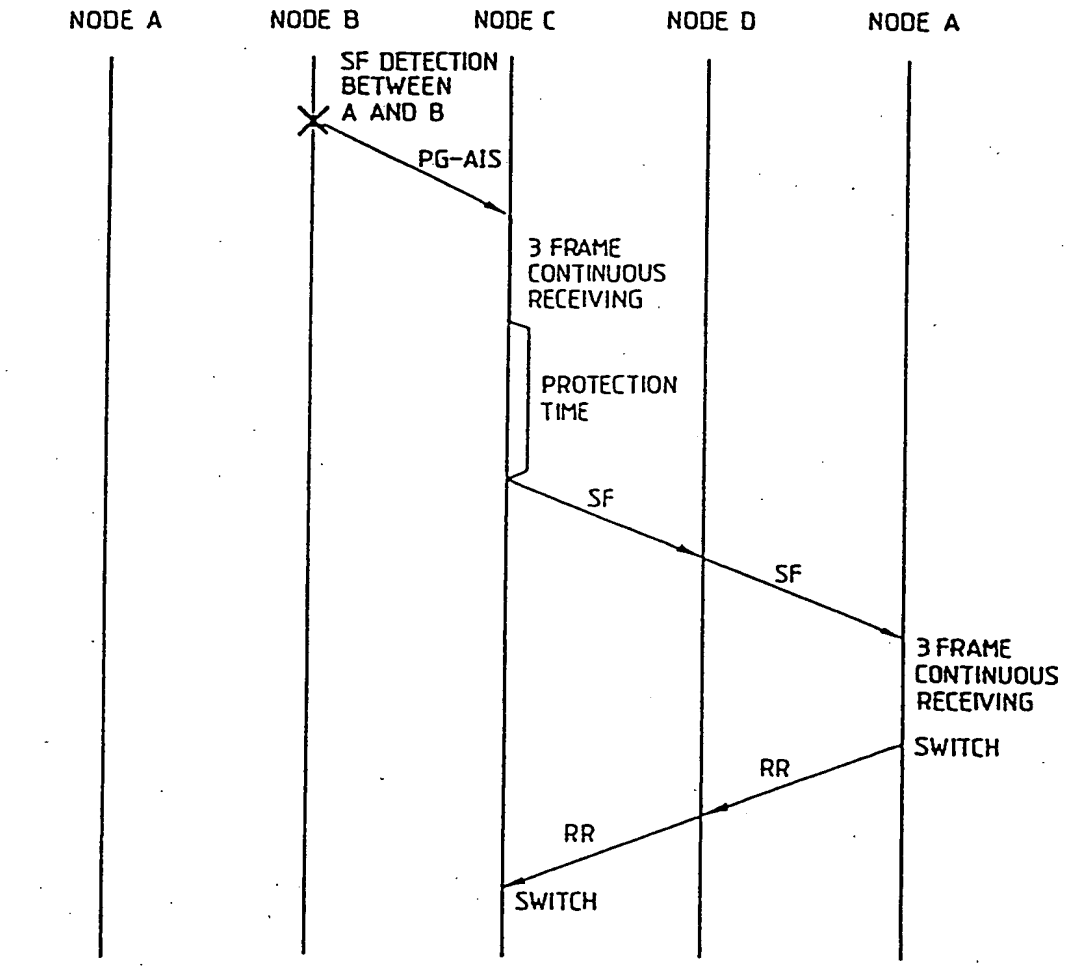

③ TRANSMISSION OF APS CONTROL SIGNAL
④ EXECUTION OF SWITCHING
NODE D
NODE C
② PATH GROUP AIS DETECTION
PATH GROUP (PROTECTION)
PATH GROUP (WORKING)
NODE A
NODE B
④ EXECUTION OF SWITCHING
① SECTION FAULT DETECTION — SENDING OF PATH GROUP AIS

FIG. 13



SF : SIGNAL FAILURE
RR : REVERS REQUEST

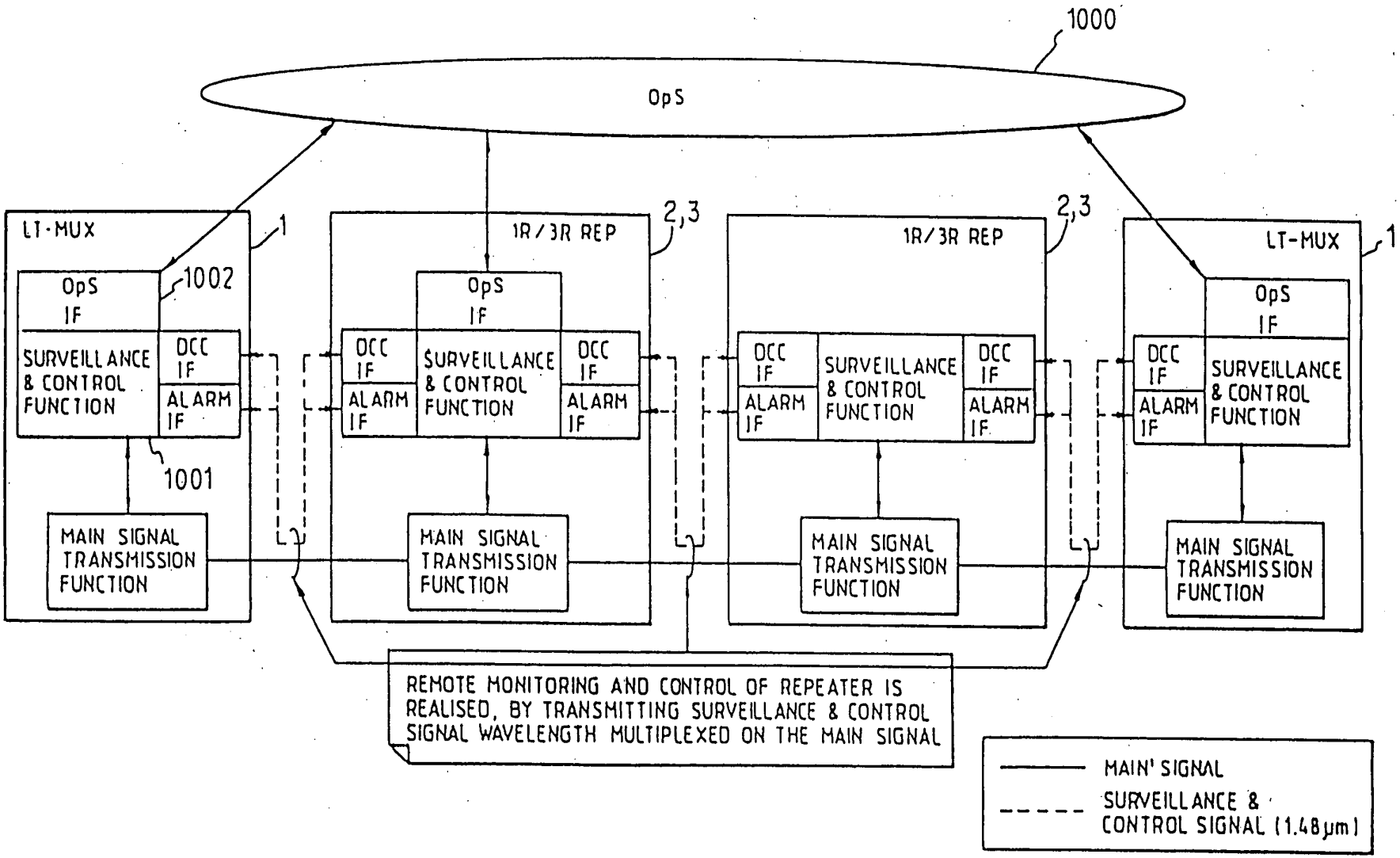
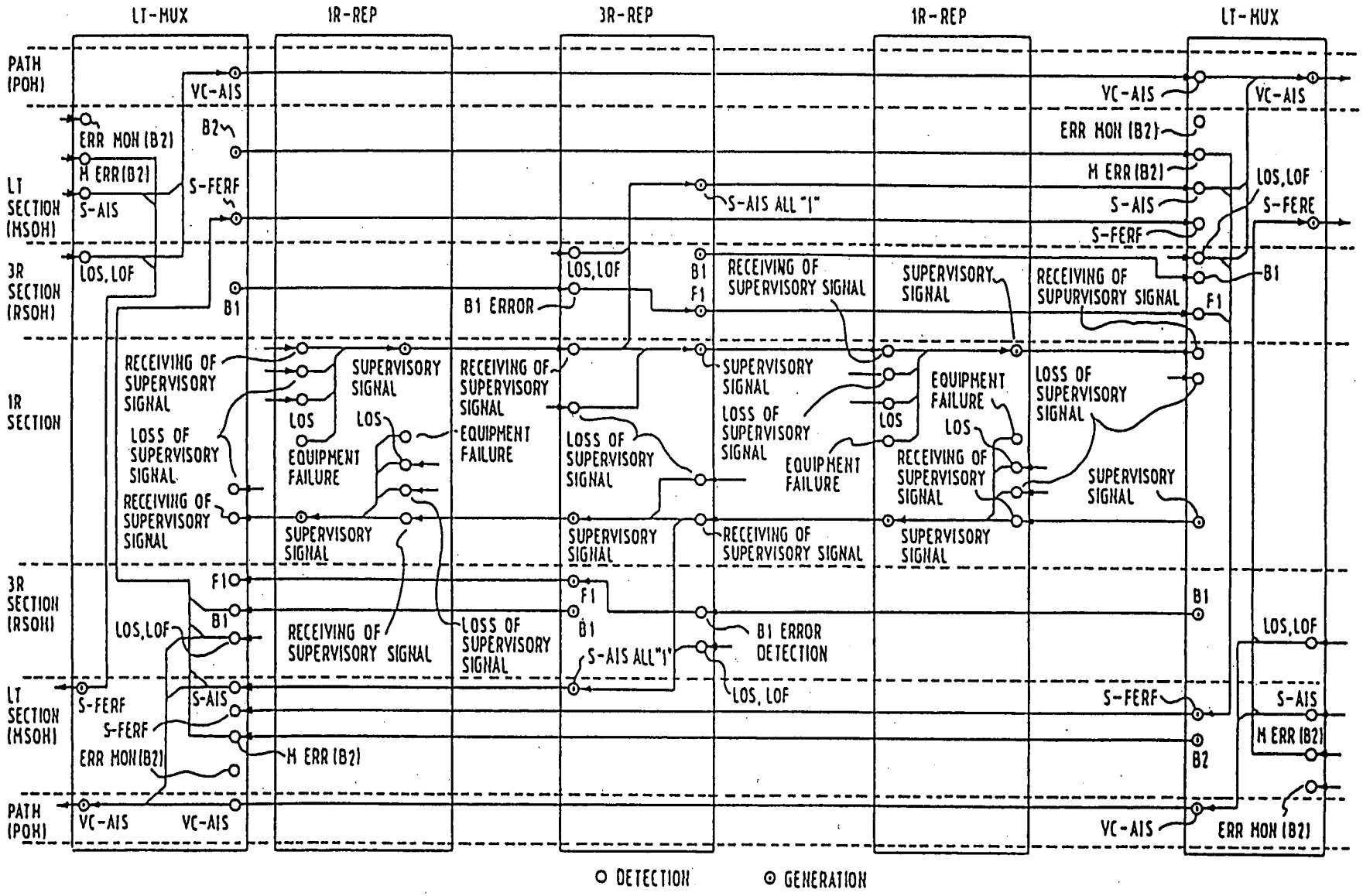

1000
OpS
LT-MUX
1
OpS IF
1002
SURVEILLANCE & CONTROL FUNCTION
DCC IF
ALARM IF
1001
MAIN SIGNAL TRANSMISSION FUNCTION
1R/3R REP
2,3
OpS IF
DCC IF
ALARM IF
SURVEILLANCE & CONTROL FUNCTION
MAIN SIGNAL TRANSMISSION FUNCTION
1R/3R REP
2,3
DCC IF
ALARM IF
SURVEILLANCE & CONTROL FUNCTION
MAIN SIGNAL TRANSMISSION FUNCTION
LT-MUX
1
OpS IF
DCC IF
ALARM IF
SURVEILLANCE & CONTROL FUNCTION
MAIN SIGNAL TRANSMISSION FUNCTION
REMOTE MONITORING AND CONTROL OF REPEATER IS REALISED, BY TRANSMITTING SURVEILLANCE & CONTROL SIGNAL WAVELENGTH MULTIPLEXED ON THE MAIN SIGNAL
MAIN SIGNAL
SURVEILLANCE & CONTROL SIGNAL (1.48μm)

FIG. 14

FIG. 15


LT-MUX
1R-REP
3R-REP
1R-REP
LT-MUX
PATH (POH)
LT SECTION (MSOH)
3R SECTION (RSOH)
1R SECTION
3R SECTION (RSOH)
LT SECTION (MSOH)
PATH (POH)
VC-AIS
B2
ERR MON (B2)
M ERR (B2)
S-FERF
S-AIS
LOS, LOF
B1
F1
S-AIS ALL "1"
B1 ERROR
RECEIVING OF SUPERVISORY SIGNAL
SUPERVISORY SIGNAL
LOS
EQUIPMENT FAILURE
LOSS OF SUPERVISORY SIGNAL
B1 ERROR DETECTION
S-FERE
VC-AIS
VC-AIS
ERR MON (B2)
M ERR (B2)
S-AIS
S-FERF
LOS, LOF
S-FERE
B1
F1
RECEIVING OF SUPURVISORY SIGNAL
SUPERVISORY SIGNAL
EQUIPMENT FAILURE
LOS
LOSS OF SUPERVISORY SIGNAL
RECEIVING OF SUPERVISORY SIGNAL
SUPERVISORY SIGNAL
B1
LOS, LOF
S-FERF
S-AIS
M ERR (B2)
B2
VC-AIS
ERR MON (B2)
O DETECTION
O GENERATION

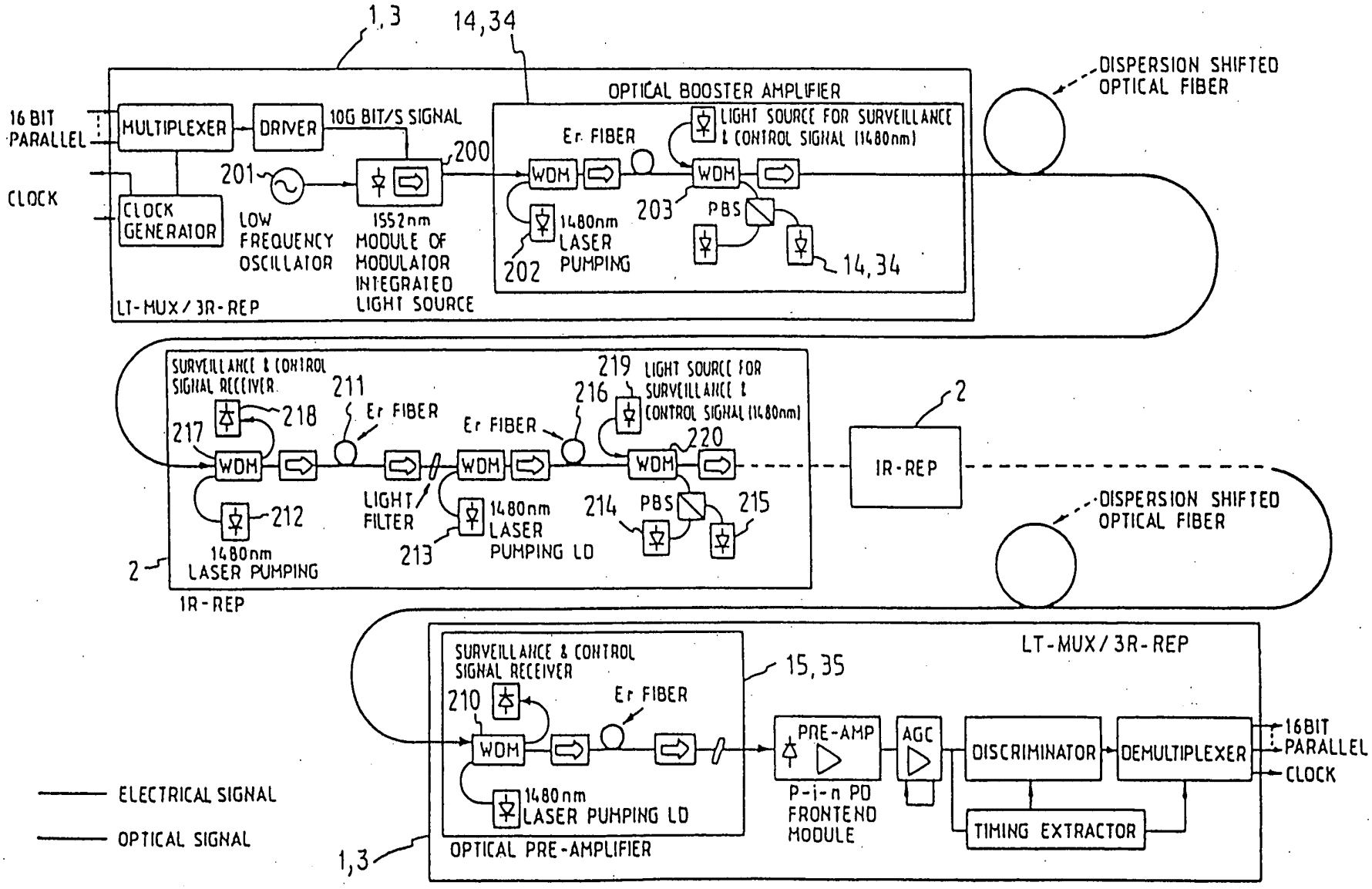

1,3
14,34
DISPERSION SHIFTED OPTICAL FIBER
OPTICAL BOOSTER AMPLIFIER
16 BIT PARALLEL
MULTIPLEXER
DRIVER
10G BIT/S SIGNAL
CLOCK
CLOCK GENERATOR
201
LOW FREQUENCY OSCILLATOR
200
1552nm MODULE OF MODULATOR INTEGRATED LIGHT SOURCE
Er FIBER
WDM
LIGHT SOURCE FOR SURVEILLANCE & CONTROL SIGNAL (1480nm)
203
PBS
202
1480nm LASER PUMPING
14,34
LT-MUX/3R-REP
SURVEILLANCE & CONTROL SIGNAL RECEIVER
211
219
LIGHT SOURCE FOR SURVEILLANCE & CONTROL SIGNAL (1480nm)
216
217
218
Er FIBER
220
2
IR-REP
LIGHT FILTER
212
213
214
215
1480nm LASER PUMPING
1480nm LASER PUMPING LD
DISPERSION SHIFTED OPTICAL FIBER
15,35
LT-MUX/3R-REP
SURVEILLANCE & CONTROL SIGNAL RECEIVER
210
PRE-AMP
AGC
DISCRIMINATOR
DEMULTIPLEXER
16BIT PARALLEL
CLOCK
P-i-n PD FRONTEND MODULE
TIMING EXTRACTOR
ELECTRICAL SIGNAL
OPTICAL SIGNAL
OPTICAL PRE-AMPLIFIER

FIG.16

FIG. 17

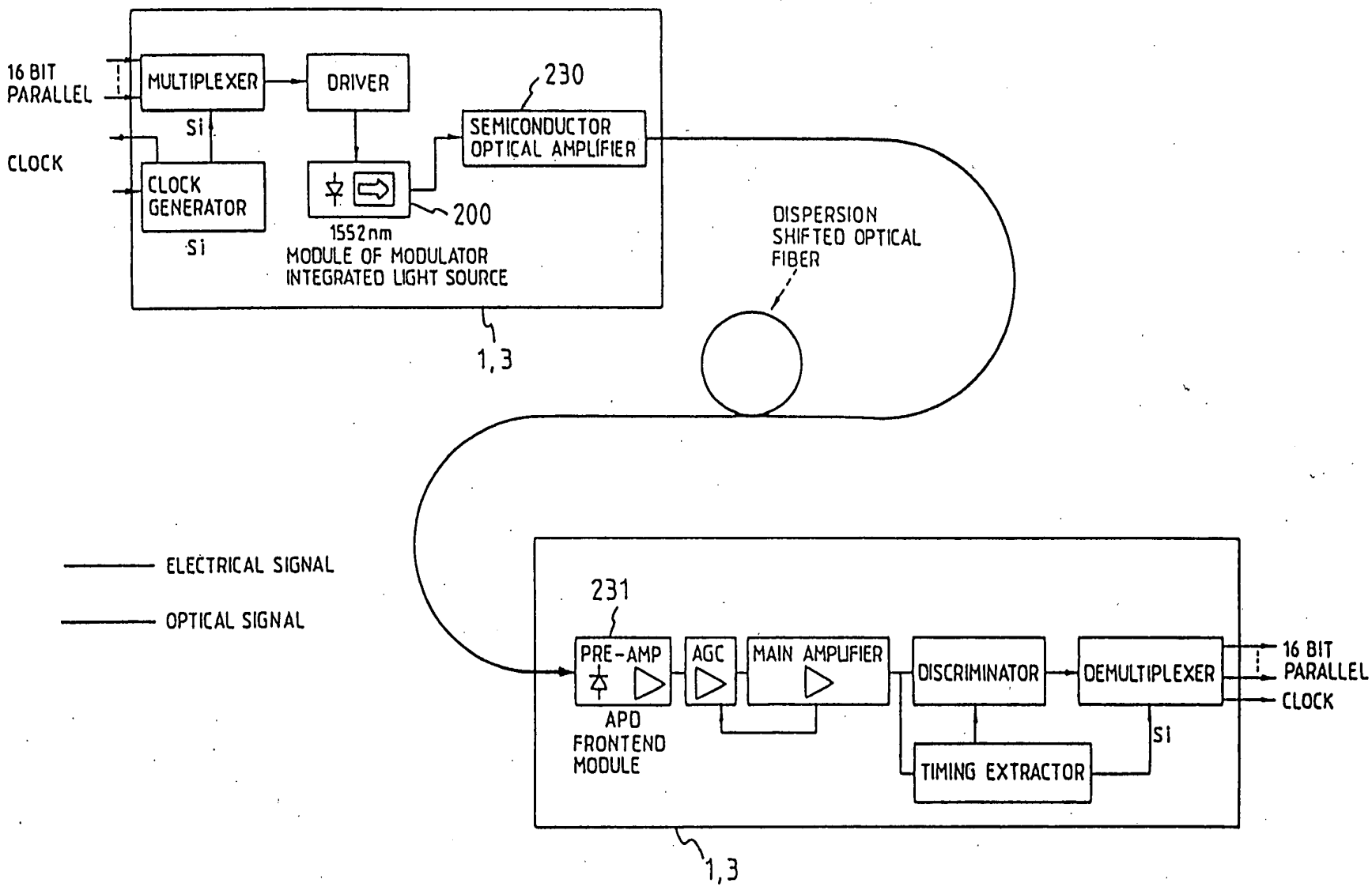

16 BIT PARALLEL
MULTIPLEXER
DRIVER
230
SEMICONDUCTOR OPTICAL AMPLIFIER
Si
CLOCK
CLOCK GENERATOR
Si
1552nm
200
MODULE OF MODULATOR INTEGRATED LIGHT SOURCE
1,3
DISPERSION SHIFTED OPTICAL FIBER
ELECTRICAL SIGNAL
OPTICAL SIGNAL
231
PRE-AMP
AGC
MAIN AMPLIFIER
DISCRIMINATOR
DEMULTIPLEXER
16 BIT PARALLEL
CLOCK
APD FRONTEND MODULE
TIMING EXTRACTOR
Si
1,3

FIG. 18

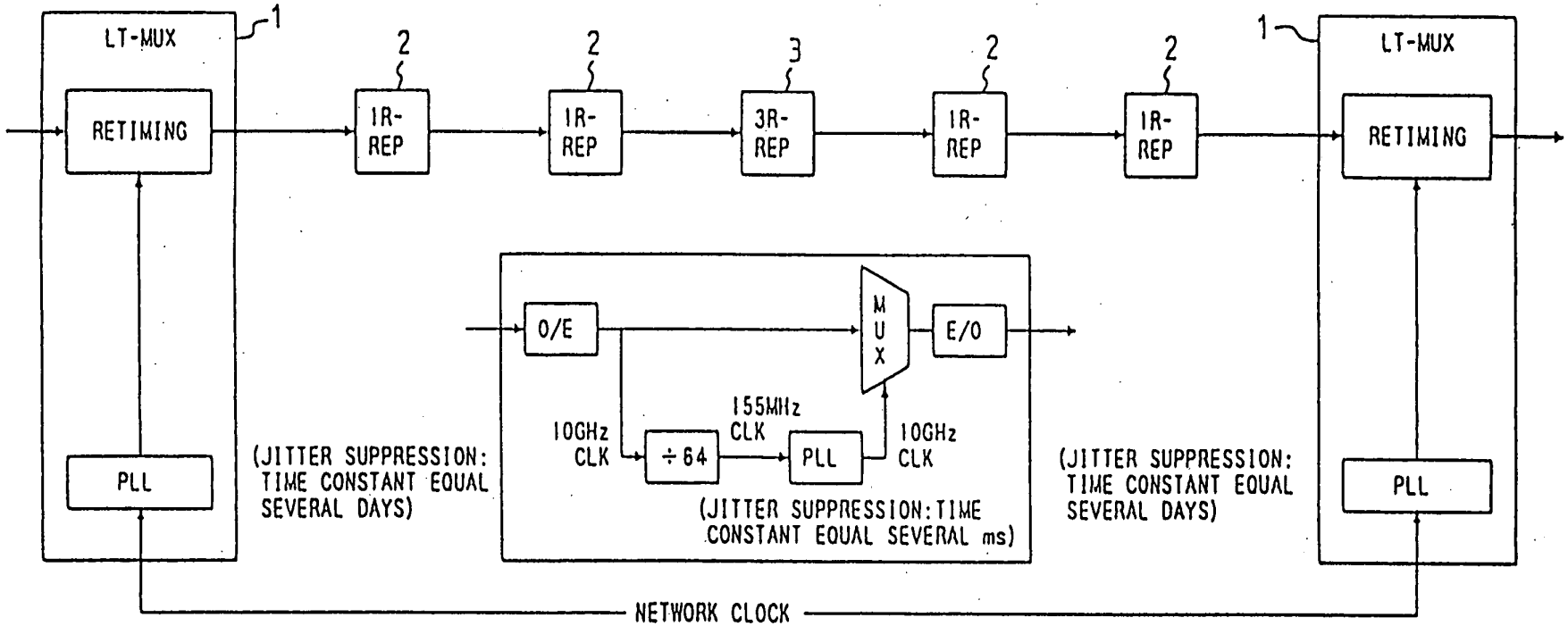

LT-MUX
1
RETIMING
PLL
2
1R-REP
2
1R-REP
3
3R-REP
2
1R-REP
2
1R-REP
1
LT-MUX
RETIMING
PLL
(JITTER SUPPRESSION: TIME CONSTANT EQUAL SEVERAL DAYS)
O/E
MUX
E/O
10GHz CLK
155MHz CLK
÷64
PLL
10GHz CLK
(JITTER SUPPRESSION: TIME CONSTANT EQUAL SEVERAL ms)
(JITTER SUPPRESSION: TIME CONSTANT EQUAL SEVERAL DAYS)
NETWORK CLOCK

FIG. 19

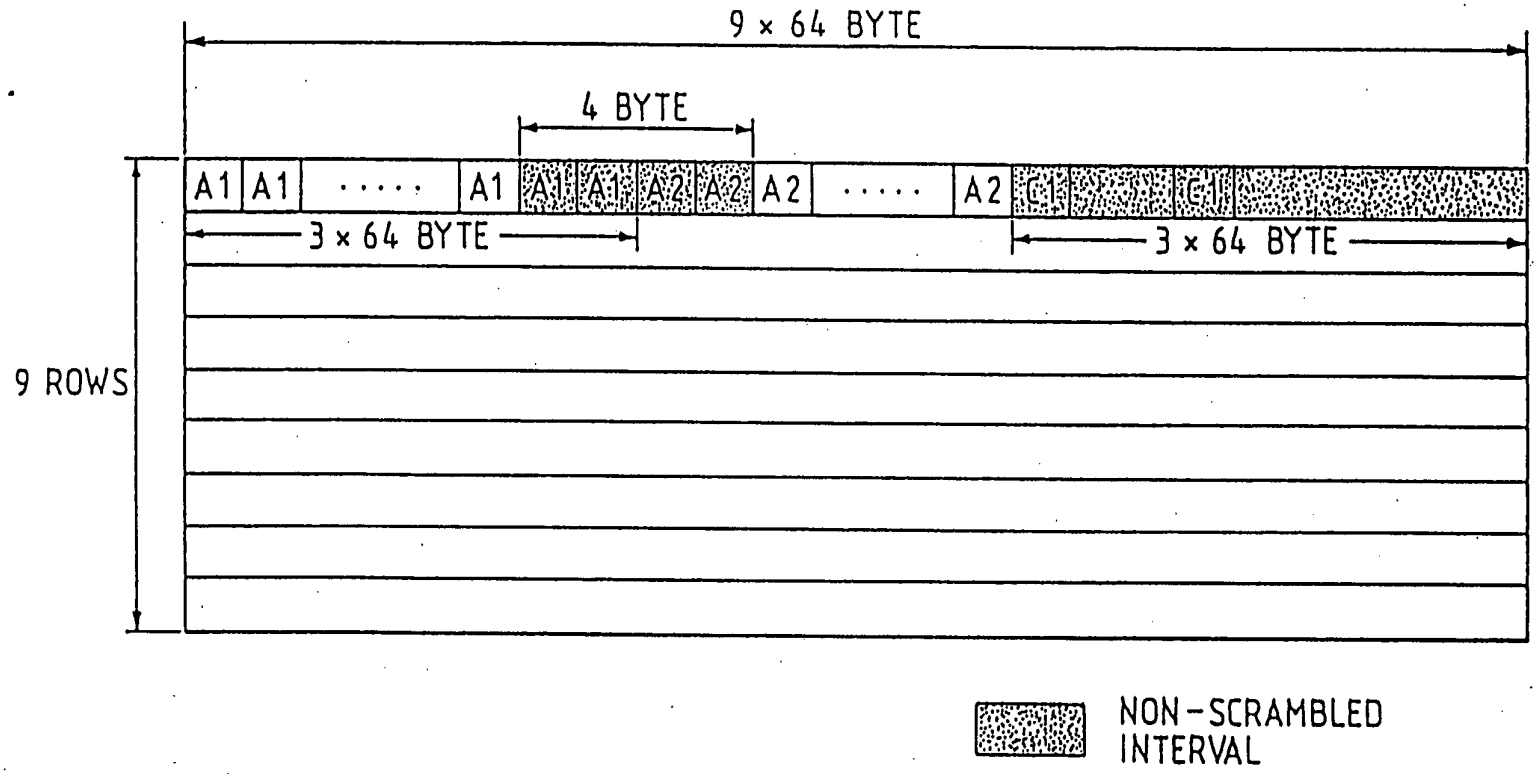

9 × 64 BYTE
4 BYTE
A1 A1 ..... A1 A1 A1 A2 A2 A2 ..... A2 C1 C1
3 × 64 BYTE
3 × 64 BYTE
9 ROWS
NON-SCRAMBLED INTERVAL

FIG. 20

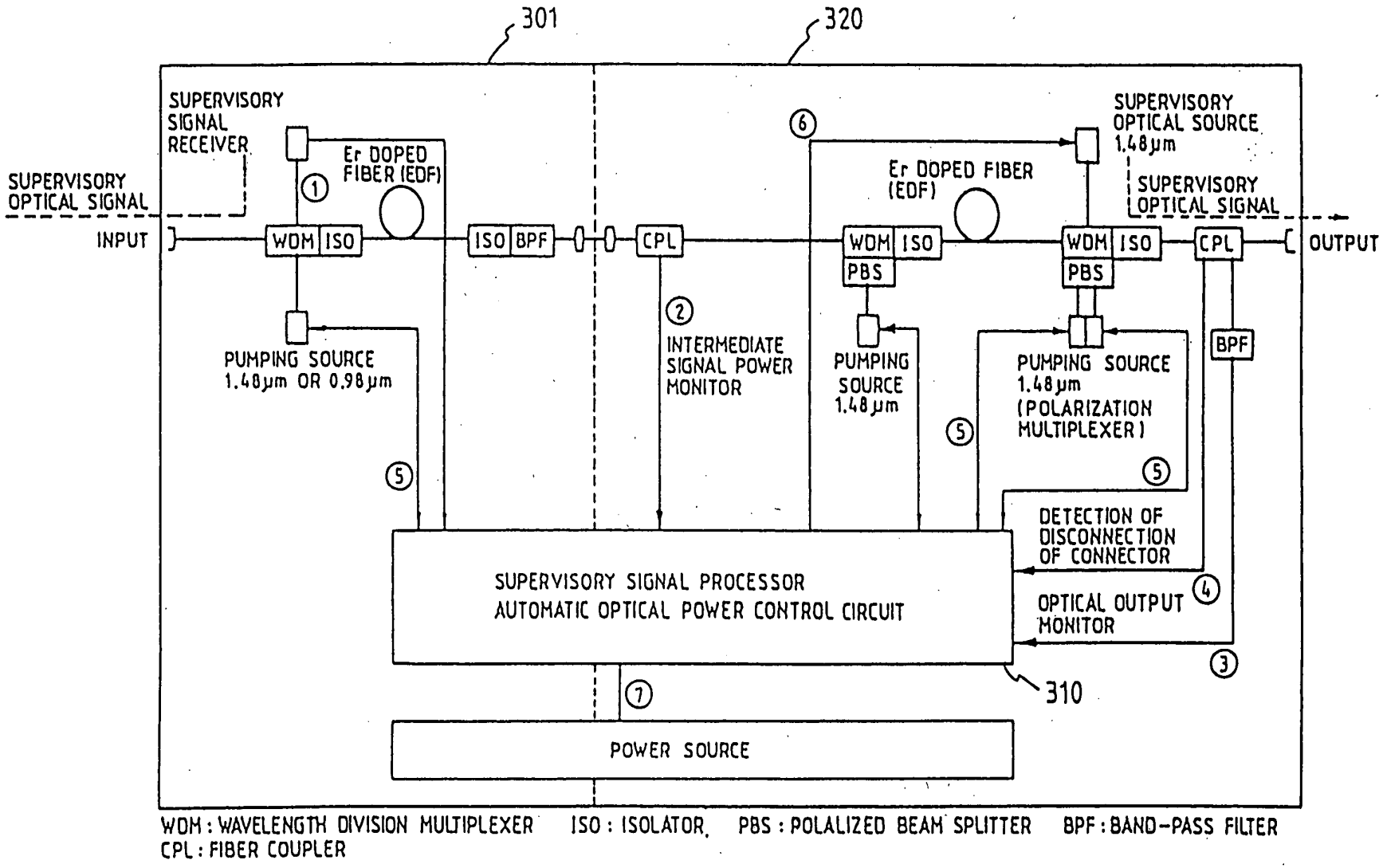

301
320
SUPERVISORY SIGNAL RECEIVER
SUPERVISORY OPTICAL SIGNAL
INPUT
Er DOPED FIBER (EDF)
WDM
ISO
ISO
BPF
CPL
PUMPING SOURCE 1.48μm OR 0.98μm
INTERMEDIATE SIGNAL POWER MONITOR
Er DOPED FIBER (EDF)
WDM
ISO
PBS
PUMPING SOURCE 1.48μm
SUPERVISORY OPTICAL SOURCE 1.48μm
SUPERVISORY OPTICAL SIGNAL
WDM
ISO
PBS
CPL
OUTPUT
BPF
PUMPING SOURCE 1.48μm (POLARIZATION MULTIPLEXER)
DETECTION OF DISCONNECTION OF CONNECTOR
OPTICAL OUTPUT MONITOR
SUPERVISORY SIGNAL PROCESSOR
AUTOMATIC OPTICAL POWER CONTROL CIRCUIT
310
POWER SOURCE
WDM : WAVELENGTH DIVISION MULTIPLEXER
ISO : ISOLATOR
PBS : POLALIZED BEAM SPLITTER
BPF : BAND-PASS FILTER
CPL : FIBER COUPLER

FIG. 21

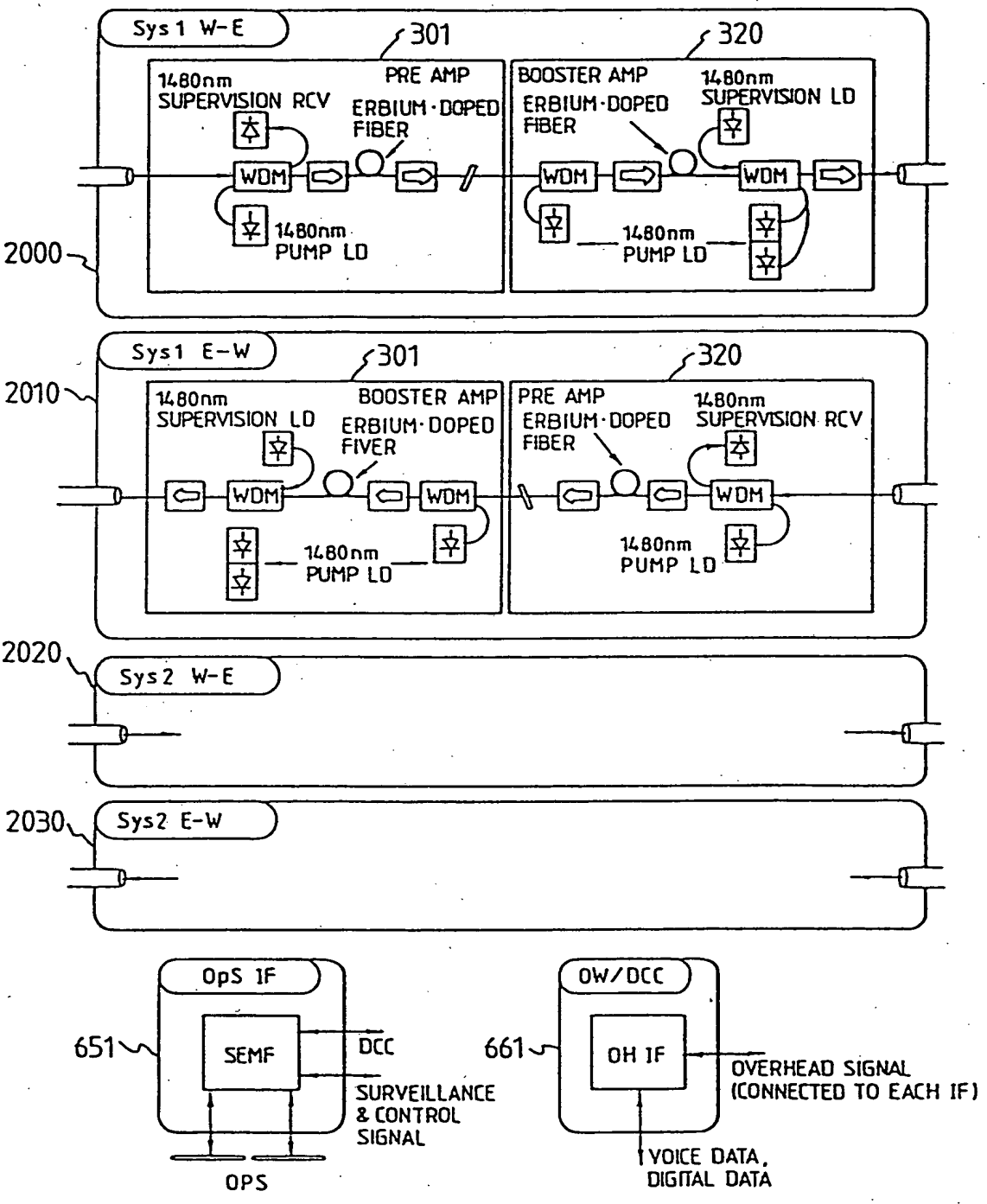
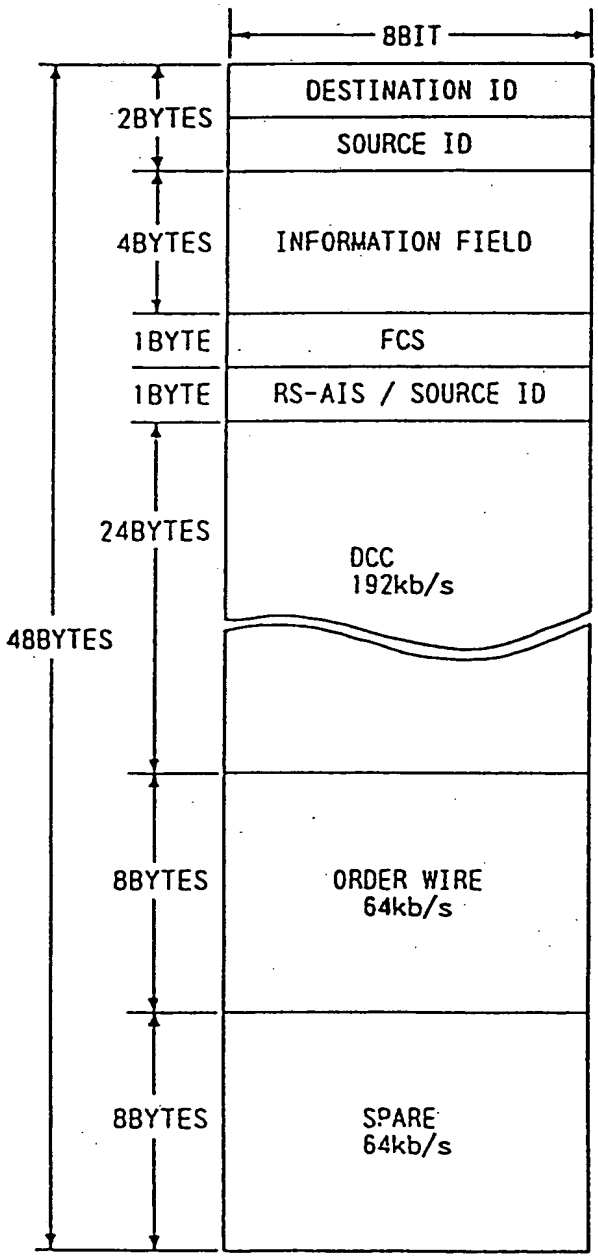

Sys 1 W-E
301
320
1480nm SUPERVISION RCV
PRE AMP
ERBIUM-DOPED FIBER
BOOSTER AMP
ERBIUM-DOPED FIBER
1480nm SUPERVISION LD
WDM
1480nm PUMP LD
2000
Sys1 E-W
2010
1480nm SUPERVISION LD
BOOSTER AMP
ERBIUM-DOPED FIVER
PRE AMP
ERBIUM-DOPED FIBER
1480nm SUPERVISION RCV
2020
Sys2 W-E
2030
Sys2 E-W
OpS IF
651
SEMF
DCC
SURVEILLANCE & CONTROL SIGNAL
OPS
OW/DCC
661
OH IF
OVERHEAD SIGNAL (CONNECTED TO EACH IF)
VOICE DATA, DIGITAL DATA

FIG. 22



FCS:FRAME CHECK SEQUENCE
(BIP-8)

CODING EXAMPLE OF RS-AIS/SOURCE ID

00000000 : NORMAL
00000001 : RS-AIS (SOURCE ID=01)
00000010 : RS-AIS (SOURCE ID=02)
00000011 : RS-AIS (SOURCE ID=03)
⋮ ⋮
11111110 : RS-AIS (SOURCE ID=FE)
11111111 : RS-AIS (SOURCE ID=FF)

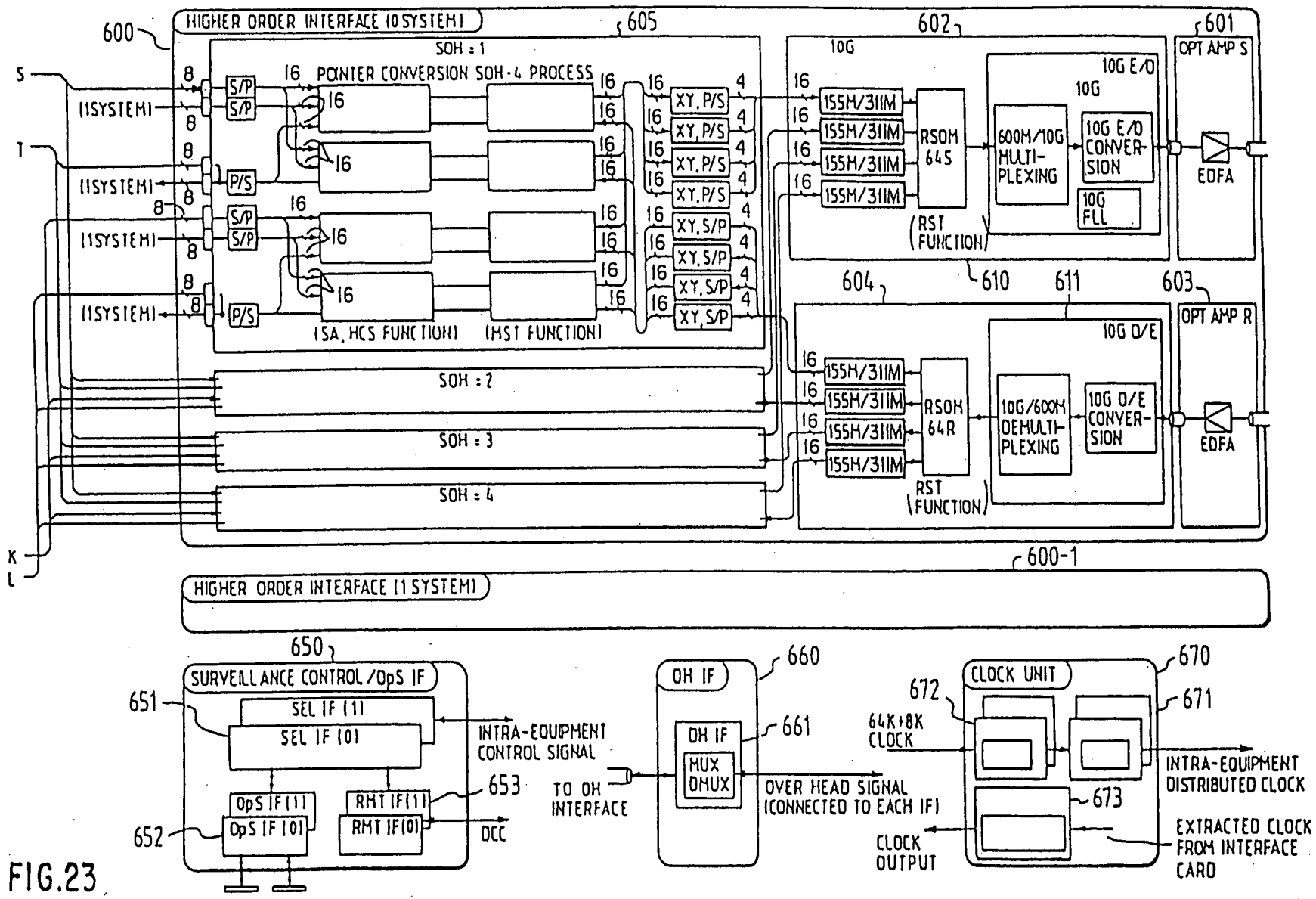

600
HIGHER ORDER INTERFACE (0 SYSTEM)
605
602
601
SOH : 1
10G
OPT AMP S
16 POINTER CONVERSION SOH-4 PROCESS
10G E/O
10G
S
(1 SYSTEM)
S/P
P/S
XY, P/S
XY, S/P
155M/311M
RSOH 64S
600M/10G MULTI-PLEXING
10G E/O CONVER-SION
10G FLL
EDFA
RST FUNCTION
T
(1 SYSTEM)
(1 SYSTEM)
(1 SYSTEM)
(SA, HCS FUNCTION)
(MST FUNCTION)
610
611
603
604
10G O/E
OPT AMP R
SOH : 2
SOH : 3
SOH : 4
RSOH 64R
10G/600M DEMULTI-PLEXING
10G O/E CONVER-SION
RST FUNCTION
K
L
600-1
HIGHER ORDER INTERFACE (1 SYSTEM)
650
SURVEILLANCE CONTROL/OpS IF
651
SEL IF (1)
SEL IF (0)
INTRA-EQUIPMENT CONTROL SIGNAL
653
OpS IF (1)
OpS IF (0)
RMT IF (1)
RMT IF (0)
652
DCC
TO OH INTERFACE
OH IF
660
OH IF
661
MUX DMUX
OVER HEAD SIGNAL (CONNECTED TO EACH IF)
672
CLOCK UNIT
670
671
64K+8K CLOCK
INTRA-EQUIPMENT DISTRIBUTED CLOCK
673
CLOCK OUTPUT
EXTRACTED CLOCK FROM INTERFACE CARD

FIG.23

FIG. 24

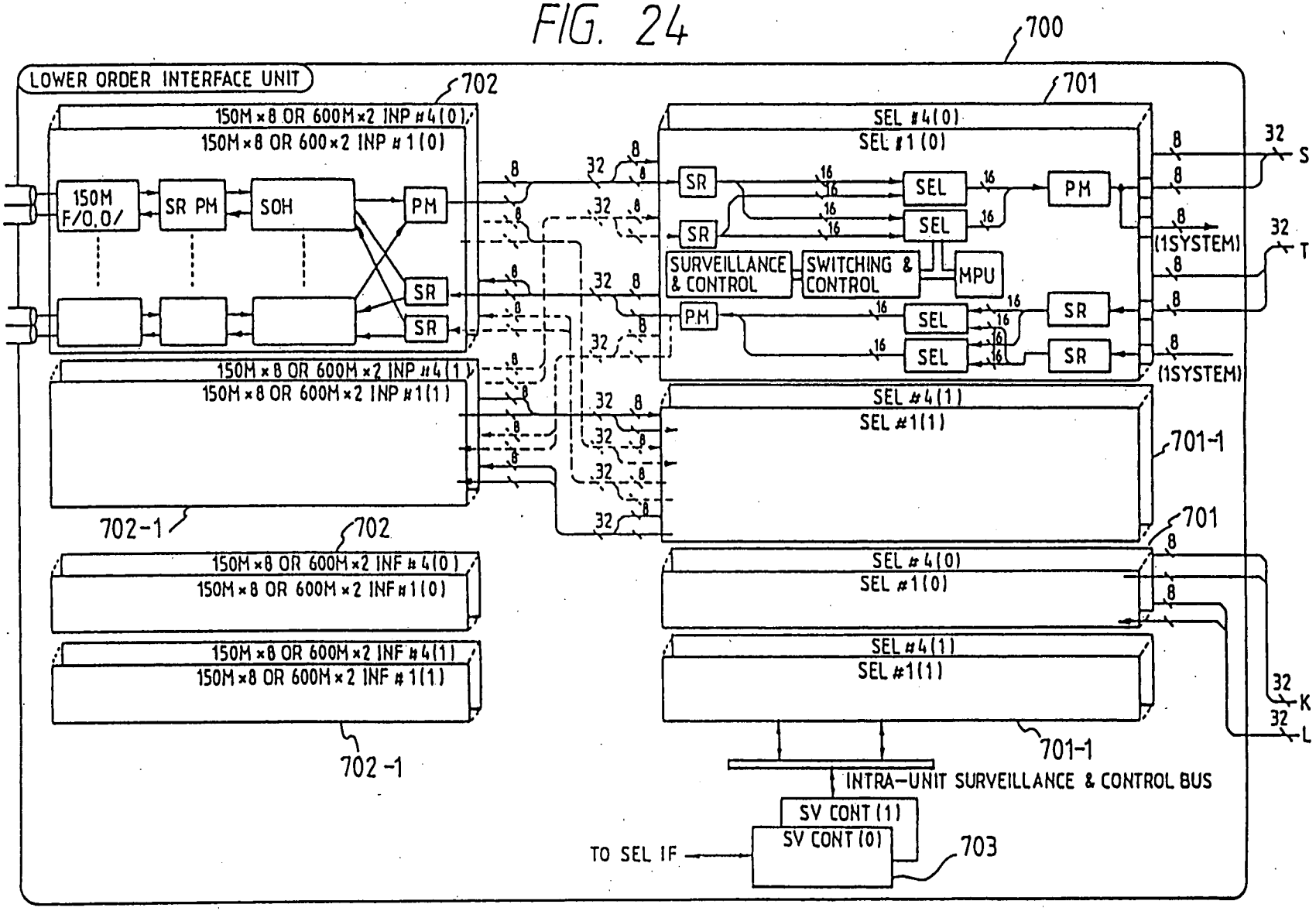
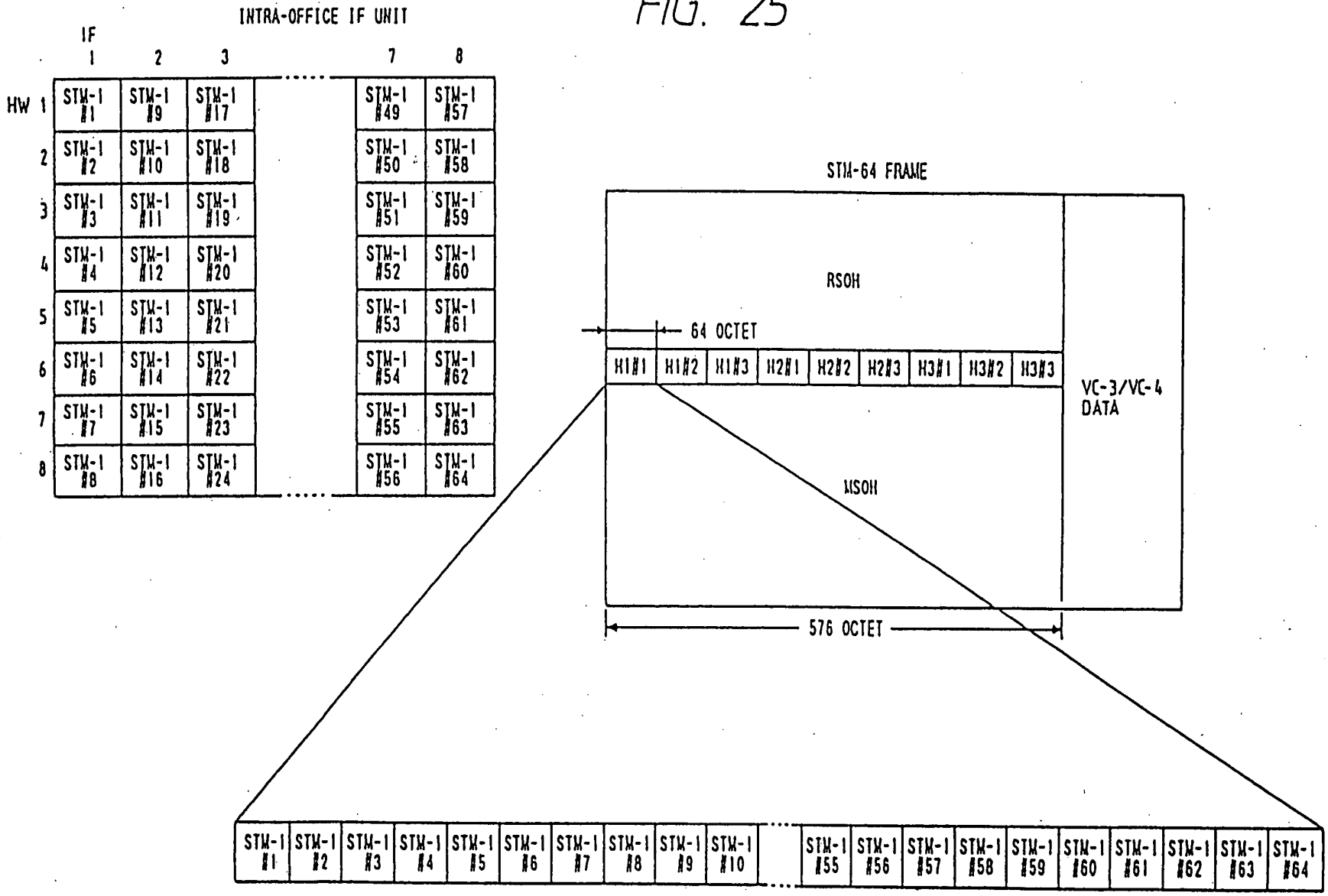

700
LOWER ORDER INTERFACE UNIT
702
150M×8 OR 600M×2 INP #4(0)
150M×8 OR 600×2 INP #1(0)
150M F/O.O/
SR PM
SOH
PM
SR
SR
701
SEL #4(0)
SEL #1(0)
SR
SR
SEL
SEL
PM
SURVEILLANCE & CONTROL
SWITCHING & CONTROL
MPU
PM
SEL
SEL
SR
SR
(1SYSTEM)
(1SYSTEM)
S
T
150M×8 OR 600M×2 INP #4(1)
150M×8 OR 600M×2 INP #1(1)
SEL #4(1)
SEL #1(1)
701-1
702-1
702
150M×8 OR 600M×2 INF #4(0)
150M×8 OR 600M×2 INF #1(0)
701
SEL #4(0)
SEL #1(0)
150M×8 OR 600M×2 INF #4(1)
150M×8 OR 600M×2 INF #1(1)
SEL #4(1)
SEL #1(1)
K
L
702-1
701-1
INTRA-UNIT SURVEILLANCE & CONTROL BUS
SV CONT(1)
SV CONT(0)
TO SEL IF
703

FIG. 25


INTRA-OFFICE IF UNIT
IF
1
2
3
7
8
HW 1
2
3
4
5
6
7
8
STM-1 #1
STM-1 #9
STM-1 #17
STM-1 #49
STM-1 #57
STM-1 #2
STM-1 #10
STM-1 #18
STM-1 #50
STM-1 #58
STM-1 #3
STM-1 #11
STM-1 #19
STM-1 #51
STM-1 #59
STM-1 #4
STM-1 #12
STM-1 #20
STM-1 #52
STM-1 #60
STM-1 #5
STM-1 #13
STM-1 #21
STM-1 #53
STM-1 #61
STM-1 #6
STM-1 #14
STM-1 #22
STM-1 #54
STM-1 #62
STM-1 #7
STM-1 #15
STM-1 #23
STM-1 #55
STM-1 #63
STM-1 #8
STM-1 #16
STM-1 #24
STM-1 #56
STM-1 #64
STM-64 FRAME
RSOH
64 OCTET
H1#1
H1#2
H1#3
H2#1
H2#2
H2#3
H3#1
H3#2
H3#3
VC-3/VC-4 DATA
MSOH
576 OCTET
STM-1 #1
STM-1 #2
STM-1 #3
STM-1 #4
STM-1 #5
STM-1 #6
STM-1 #7
STM-1 #8
STM-1 #9
STM-1 #10
STM-1 #55
STM-1 #56
STM-1 #57
STM-1 #58
STM-1 #59
STM-1 #60
STM-1 #61
STM-1 #62
STM-1 #63
STM-1 #64

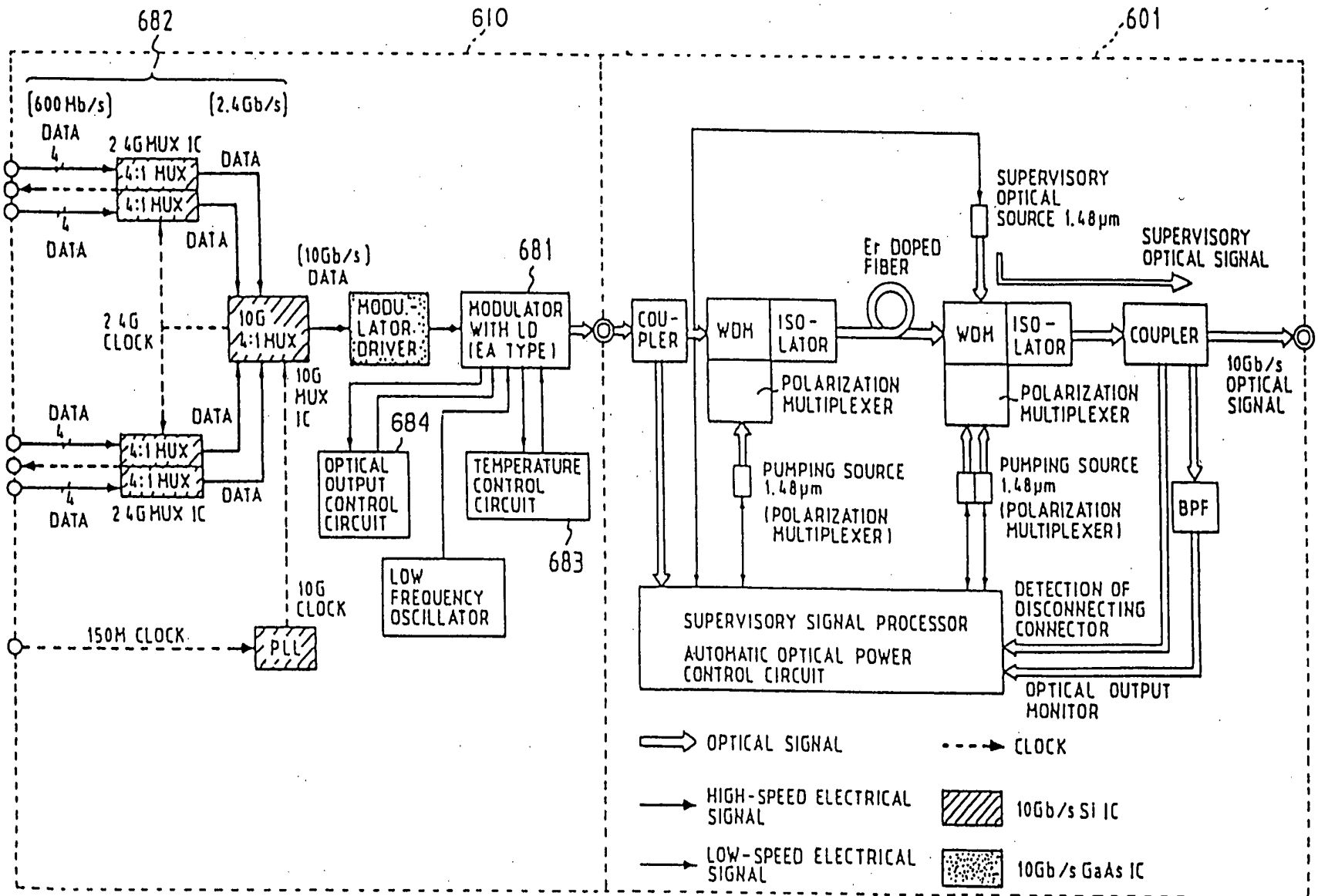

682
610
601
(600Mb/s)
(2.4Gb/s)
DATA
4
2.4G MUX IC
4:1 MUX
4:1 MUX
DATA
4
DATA
DATA
(10Gb/s)
DATA
681
2.4G CLOCK
10G 4:1 MUX
MODU-LATOR DRIVER
MODULATOR WITH LD (EA TYPE)
10G MUX IC
684
OPTICAL OUTPUT CONTROL CIRCUIT
TEMPERATURE CONTROL CIRCUIT
683
LOW FREQUENCY OSCILLATOR
10G CLOCK
150M CLOCK
PLL
COU-PLER
WDM
ISO-LATOR
POLARIZATION MULTIPLEXER
PUMPING SOURCE 1.48μm (POLARIZATION MULTIPLEXER)
Er DOPED FIBER
SUPERVISORY OPTICAL SOURCE 1.48μm
SUPERVISORY OPTICAL SIGNAL
COUPLER
10Gb/s OPTICAL SIGNAL
BPF
SUPERVISORY SIGNAL PROCESSOR
AUTOMATIC OPTICAL POWER CONTROL CIRCUIT
DETECTION OF DISCONNECTING CONNECTOR
OPTICAL OUTPUT MONITOR
OPTICAL SIGNAL
CLOCK
HIGH-SPEED ELECTRICAL SIGNAL
LOW-SPEED ELECTRICAL SIGNAL
10Gb/s Si IC
10Gb/s GaAs IC

FIG. 26

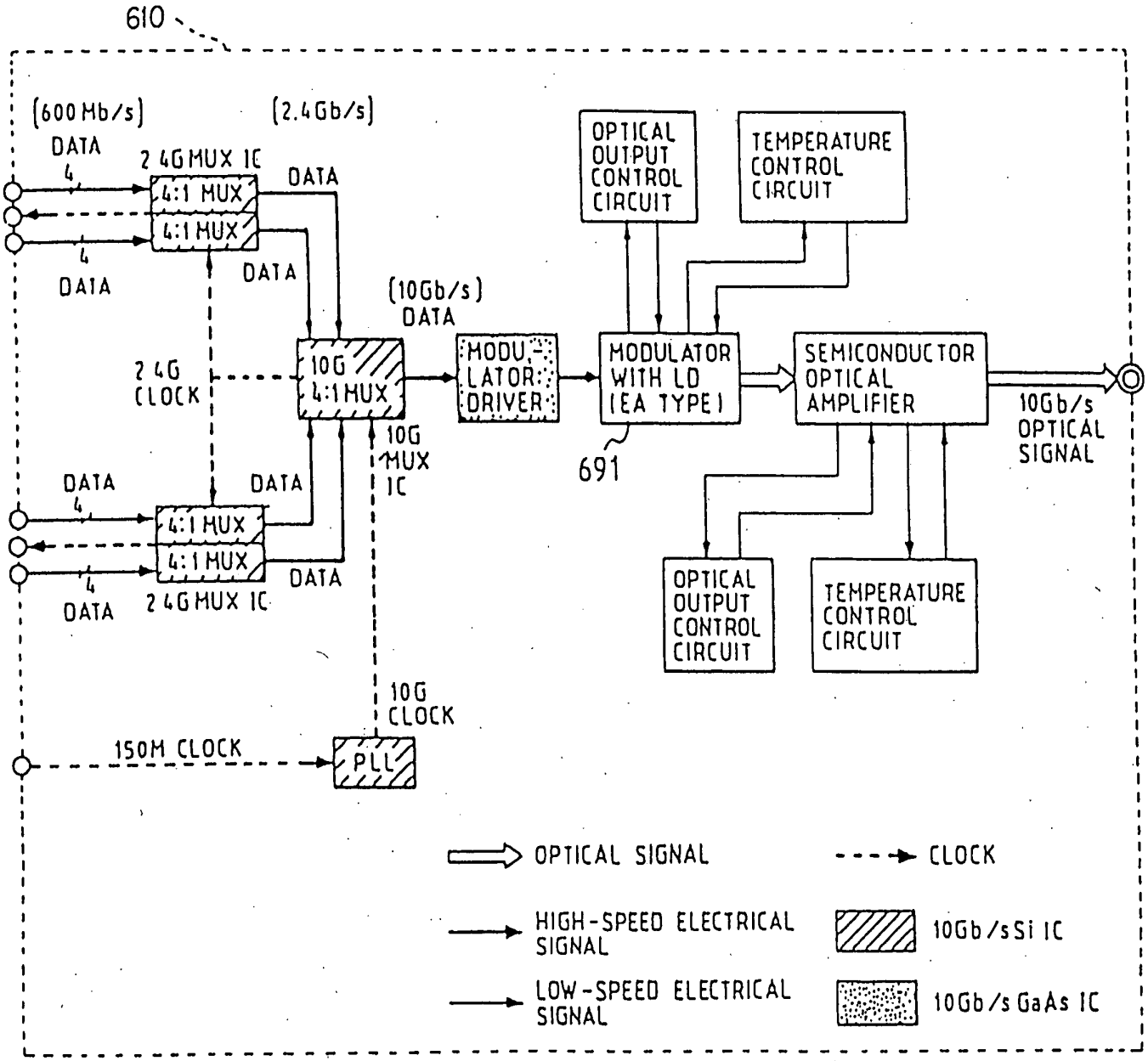

610
(600Mb/s)
DATA
4
2.4G MUX IC
4:1 MUX
4:1 MUX
DATA
4
DATA
DATA
(2.4Gb/s)
(10Gb/s)
DATA
2.4G
CLOCK
10G
4:1 MUX
10G
MUX
IC
MODU-
LATOR
DRIVER
OPTICAL
OUTPUT
CONTROL
CIRCUIT
TEMPERATURE
CONTROL
CIRCUIT
MODULATOR
WITH LD
(EA TYPE)
691
SEMICONDUCTOR
OPTICAL
AMPLIFIER
10Gb/s
OPTICAL
SIGNAL
DATA
4
DATA
4:1 MUX
4:1 MUX
DATA
4
DATA
2.4G MUX IC
OPTICAL
OUTPUT
CONTROL
CIRCUIT
TEMPERATURE
CONTROL
CIRCUIT
10G
CLOCK
150M CLOCK
PLL
OPTICAL SIGNAL
CLOCK
HIGH-SPEED ELECTRICAL
SIGNAL
10Gb/s Si IC
LOW-SPEED ELECTRICAL
SIGNAL
10Gb/s GaAs IC

FIG. 27

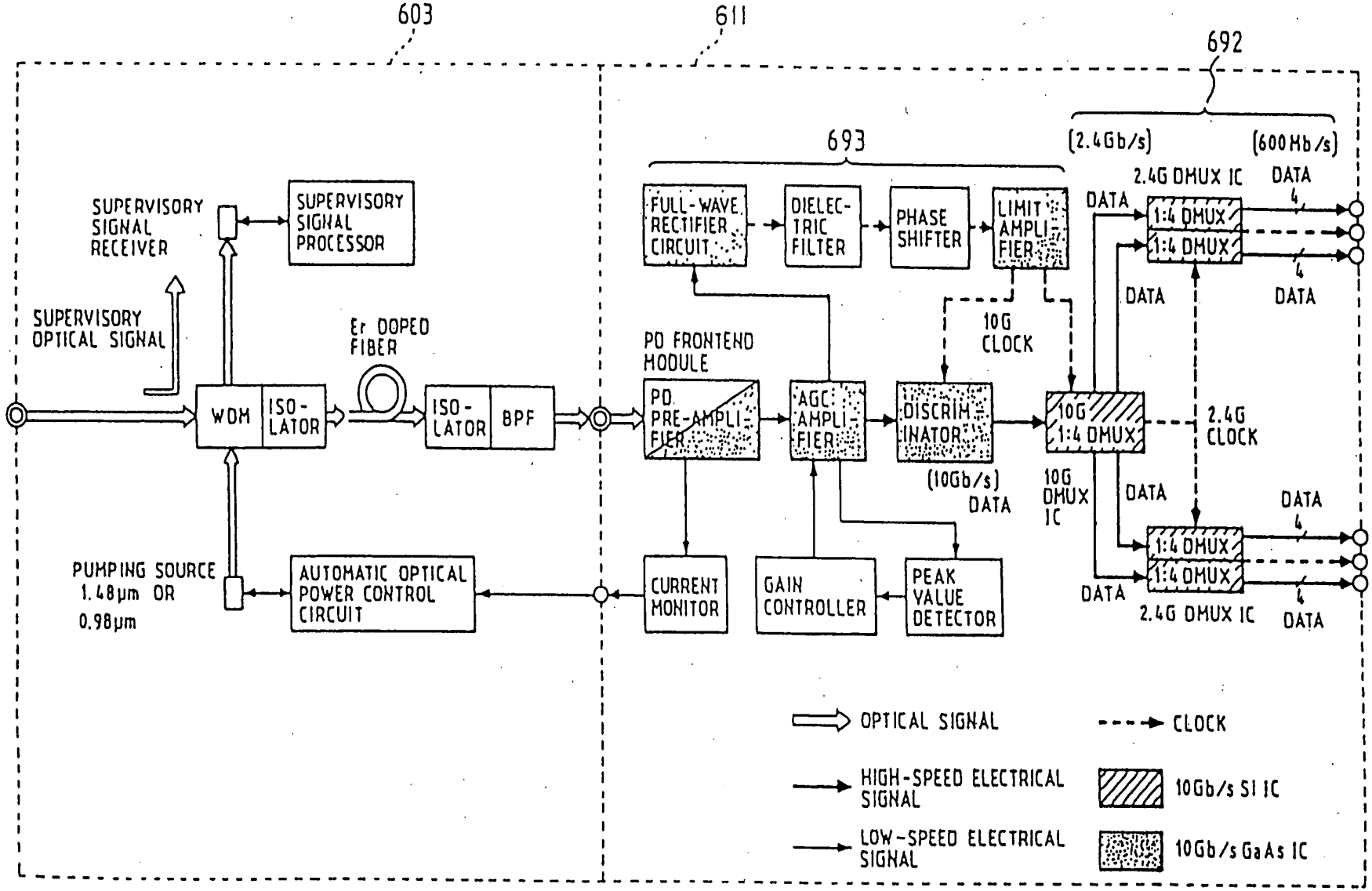

603
611
692
693
(2.4Gb/s)
(600Mb/s)
SUPERVISORY SIGNAL RECEIVER
SUPERVISORY SIGNAL PROCESSOR
SUPERVISORY OPTICAL SIGNAL
Er DOPED FIBER
WDM
ISO-LATOR
ISO-LATOR
BPF
PD FRONTEND MODULE
PD PRE-AMPLI-FIER
AGC AMPLI-FIER
DISCRIM-INATOR
(10Gb/s) DATA
FULL-WAVE RECTIFIER CIRCUIT
DIELEC-TRIC FILTER
PHASE SHIFTER
LIMIT AMPLI-FIER
10G CLOCK
10G 1:4 DMUX
10G DMUX IC
2.4G CLOCK
DATA
2.4G DMUX IC
1:4 DMUX
1:4 DMUX
1:4 DMUX
1:4 DMUX
2.4G DMUX IC
4
PUMPING SOURCE 1.48μm OR 0.98μm
AUTOMATIC OPTICAL POWER CONTROL CIRCUIT
CURRENT MONITOR
GAIN CONTROLLER
PEAK VALUE DETECTOR
OPTICAL SIGNAL
CLOCK
HIGH-SPEED ELECTRICAL SIGNAL
LOW-SPEED ELECTRICAL SIGNAL
10Gb/s SI IC
10Gb/s GaAs IC

FIG.28

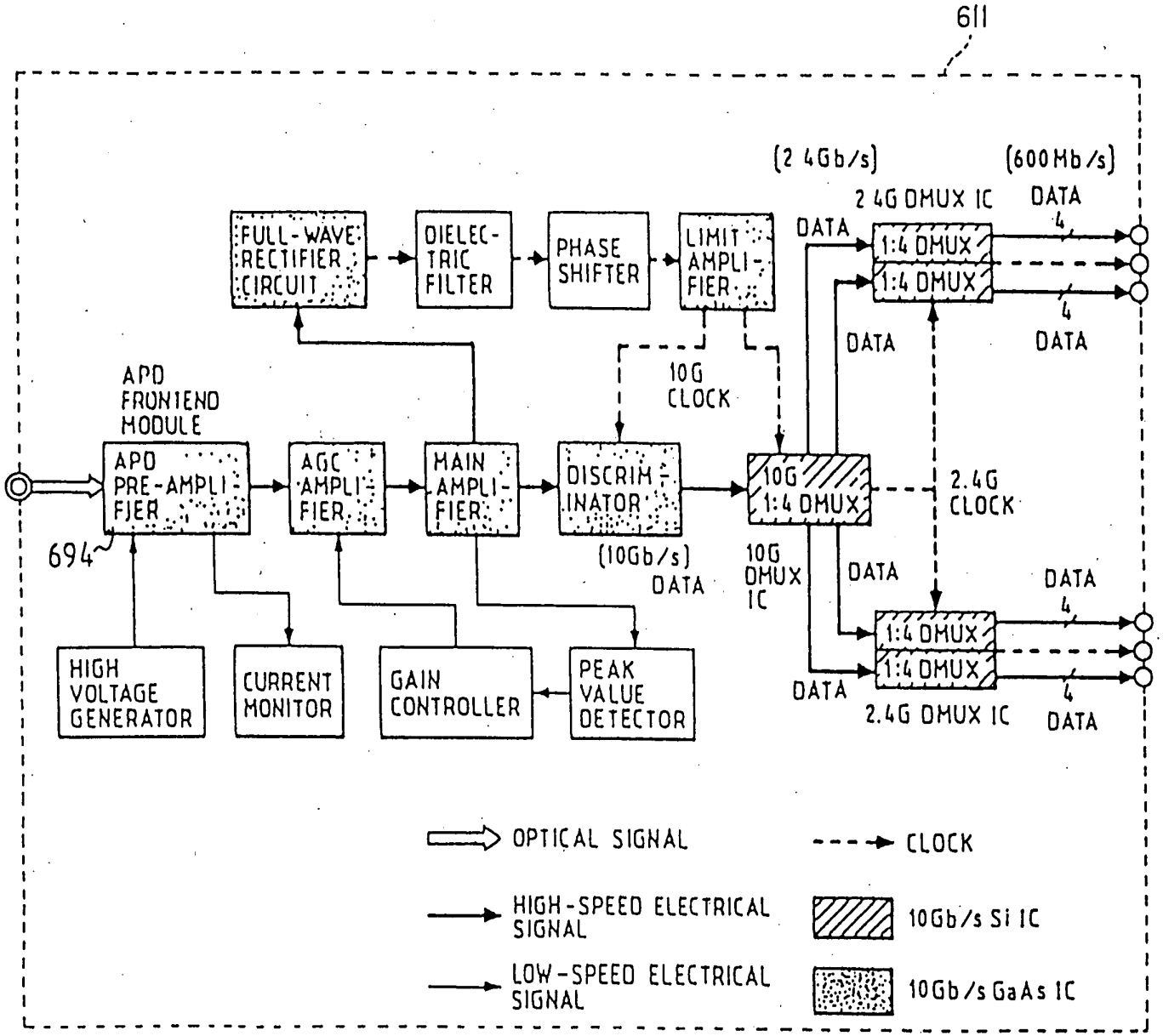

611
(2.4Gb/s)
(600Mb/s)
2.4G DMUX IC
DATA
4
FULL-WAVE RECTIFIER CIRCUIT
DIELECTRIC FILTER
PHASE SHIFTER
LIMIT AMPLIFIER
1:4 DMUX
1:4 DMUX
DATA
4
DATA
DATA
10G CLOCK
APD FRONTEND MODULE
APD PRE-AMPLIFJER
AGC AMPLIFIER
MAIN AMPLIFIER
DISCRIMINATOR
10G 1:4 DMUX
2.4G CLOCK
694
(10Gb/s) DATA
10G DMUX IC
DATA
DATA
4
HIGH VOLTAGE GENERATOR
CURRENT MONITOR
GAIN CONTROLLER
PEAK VALUE DETECTOR
1:4 DMUX
1:4 DMUX
DATA
2.4G DMUX IC
4
DATA
OPTICAL SIGNAL
CLOCK
HIGH-SPEED ELECTRICAL SIGNAL
10Gb/s Si IC
LOW-SPEED ELECTRICAL SIGNAL
10Gb/s GaAs IC

FIG. 29

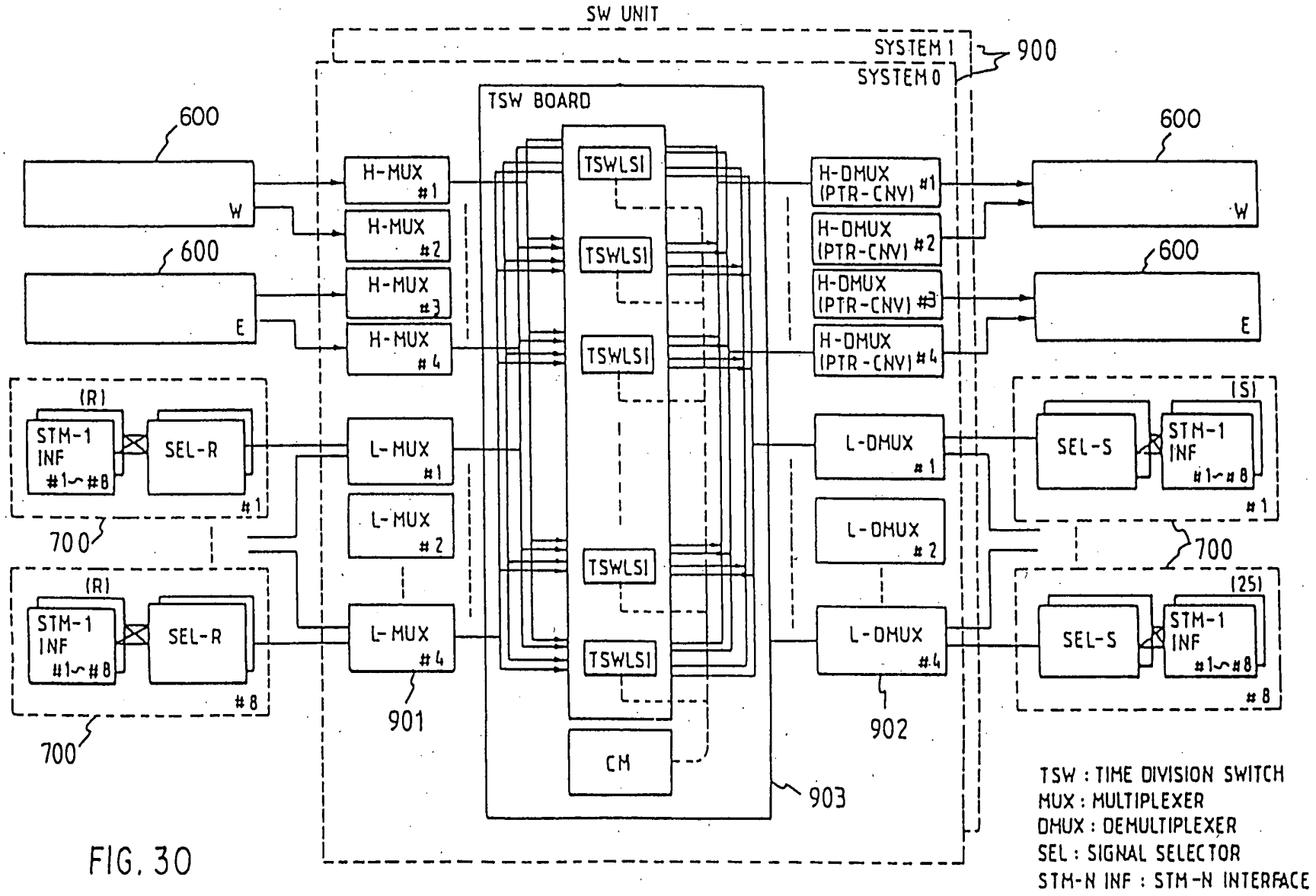

SW UNIT
SYSTEM 1
SYSTEM 0
900
TSW BOARD
600
W
600
E
H-MUX #1
H-MUX #2
H-MUX #3
H-MUX #4
TSWLSI
TSWLSI
TSWLSI
TSWLSI
TSWLSI
CM
H-DMUX (PTR-CNV) #1
H-DMUX (PTR-CNV) #2
H-DMUX (PTR-CNV) #3
H-DMUX (PTR-CNV) #4
600
W
600
E
(R)
STM-1 INF #1~#8
SEL-R
#1
700
(R)
STM-1 INF #1~#8
SEL-R
#8
700
L-MUX #1
L-MUX #2
L-MUX #4
901
L-DMUX #1
L-DMUX #2
L-DMUX #4
902
(S)
SEL-S
STM-1 INF #1~#8
#1
700
(25)
SEL-S
STM-1 INF #1~#8
#8
903
TSW : TIME DIVISION SWITCH
MUX : MULTIPLEXER
DMUX : DEMULTIPLEXER
SEL : SIGNAL SELECTOR
STM-N INF : STM-N INTERFACE

FIG. 30

FIG. 31

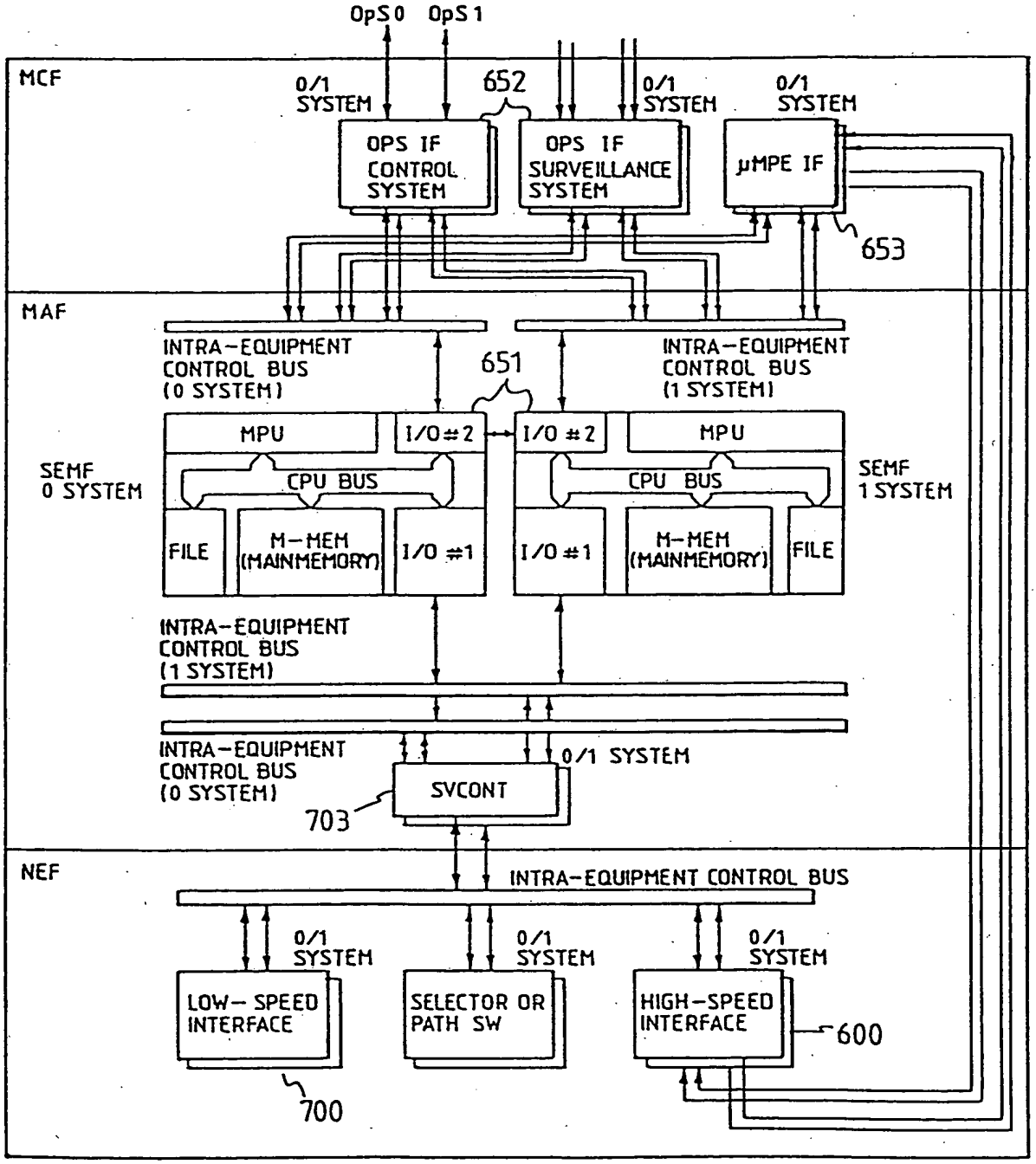

OpS 0
OpS 1
MCF
0/1 SYSTEM
652
0/1 SYSTEM
0/1 SYSTEM
OPS IF CONTROL SYSTEM
OPS IF SURVEILLANCE SYSTEM
μMPE IF
653
MAF
INTRA-EQUIPMENT CONTROL BUS (0 SYSTEM)
651
INTRA-EQUIPMENT CONTROL BUS (1 SYSTEM)
MPU
I/O #2
I/O #2
MPU
SEMF 0 SYSTEM
CPU BUS
CPU BUS
SEMF 1 SYSTEM
FILE
M-MEM (MAINMEMORY)
I/O #1
I/O #1
M-MEM (MAINMEMORY)
FILE
INTRA-EQUIPMENT CONTROL BUS (1 SYSTEM)
INTRA-EQUIPMENT CONTROL BUS (0 SYSTEM)
0/1 SYSTEM
SVCONT
703
NEF
INTRA-EQUIPMENT CONTROL BUS
0/1 SYSTEM
0/1 SYSTEM
0/1 SYSTEM
LOW-SPEED INTERFACE
SELECTOR OR PATH SW
HIGH-SPEED INTERFACE
600
700

FIG. 32

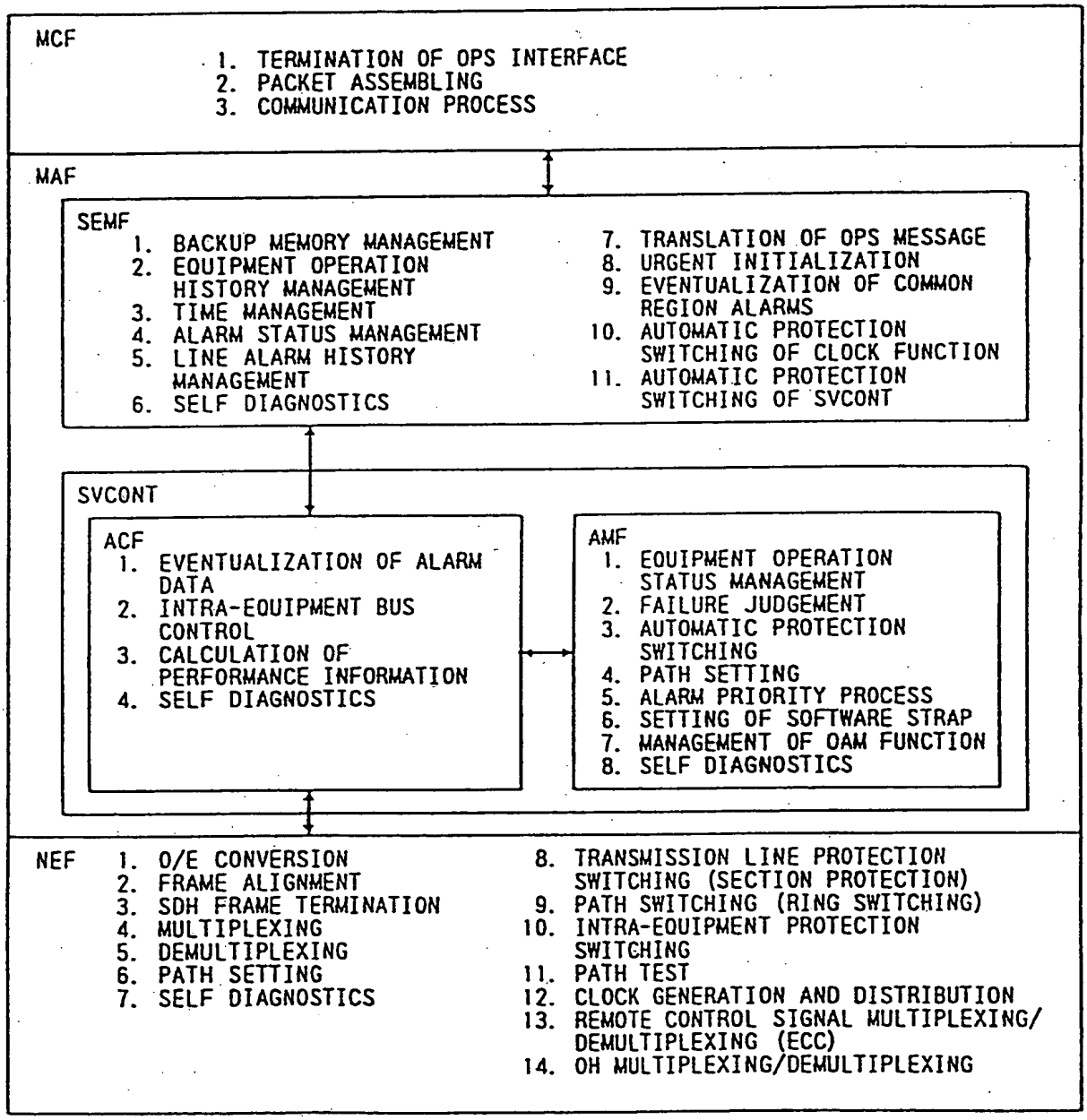

MCF
1. TERMINATION OF OPS INTERFACE
2. PACKET ASSEMBLING
3. COMMUNICATION PROCESS
MAF
SEMF
1. BACKUP MEMORY MANAGEMENT
2. EQUIPMENT OPERATION HISTORY MANAGEMENT
3. TIME MANAGEMENT
4. ALARM STATUS MANAGEMENT
5. LINE ALARM HISTORY MANAGEMENT
6. SELF DIAGNOSTICS
7. TRANSLATION OF OPS MESSAGE
8. URGENT INITIALIZATION
9. EVENTUALIZATION OF COMMON REGION ALARMS
10. AUTOMATIC PROTECTION SWITCHING OF CLOCK FUNCTION
11. AUTOMATIC PROTECTION SWITCHING OF SVCONT
SVCONT
ACF
1. EVENTUALIZATION OF ALARM DATA
2. INTRA-EQUIPMENT BUS CONTROL
3. CALCULATION OF PERFORMANCE INFORMATION
4. SELF DIAGNOSTICS
AMF
1. EQUIPMENT OPERATION STATUS MANAGEMENT
2. FAILURE JUDGEMENT
3. AUTOMATIC PROTECTION SWITCHING
4. PATH SETTING
5. ALARM PRIORITY PROCESS
6. SETTING OF SOFTWARE STRAP
7. MANAGEMENT OF OAM FUNCTION
8. SELF DIAGNOSTICS
NEF
1. O/E CONVERSION
2. FRAME ALIGNMENT
3. SDH FRAME TERMINATION
4. MULTIPLEXING
5. DEMULTIPLEXING
6. PATH SETTING
7. SELF DIAGNOSTICS
8. TRANSMISSION LINE PROTECTION SWITCHING (SECTION PROTECTION)
9. PATH SWITCHING (RING SWITCHING)
10. INTRA-EQUIPMENT PROTECTION SWITCHING
11. PATH TEST
12. CLOCK GENERATION AND DISTRIBUTION
13. REMOTE CONTROL SIGNAL MULTIPLEXING/DEMULTIPLEXING (ECC)
14. OH MULTIPLEXING/DEMULTIPLEXING

FIG. 33

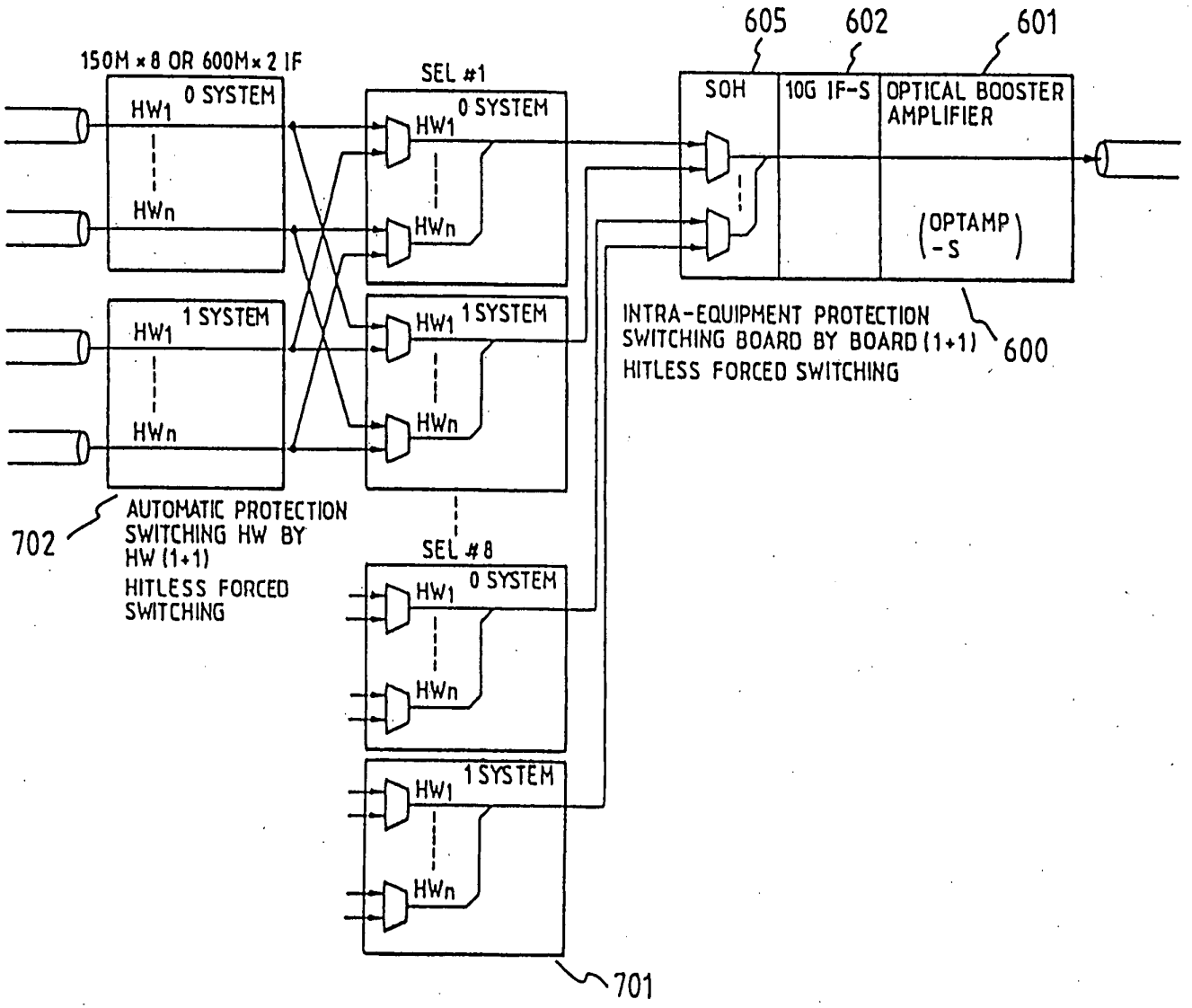

605
602
601
150M × 8 OR 600M × 2 IF
0 SYSTEM
HW1
HWn
1 SYSTEM
HW1
HWn
SEL #1
0 SYSTEM
HW1
HWn
1 SYSTEM
HW1
HWn
SEL #8
0 SYSTEM
HW1
HWn
1 SYSTEM
HW1
HWn
SOH
10G IF-S
OPTICAL BOOSTER AMPLIFIER
(OPTAMP -S)
INTRA-EQUIPMENT PROTECTION SWITCHING BOARD BY BOARD (1+1)
HITLESS FORCED SWITCHING
600
AUTOMATIC PROTECTION SWITCHING HW BY HW (1+1)
HITLESS FORCED SWITCHING
702
701

FIG. 34

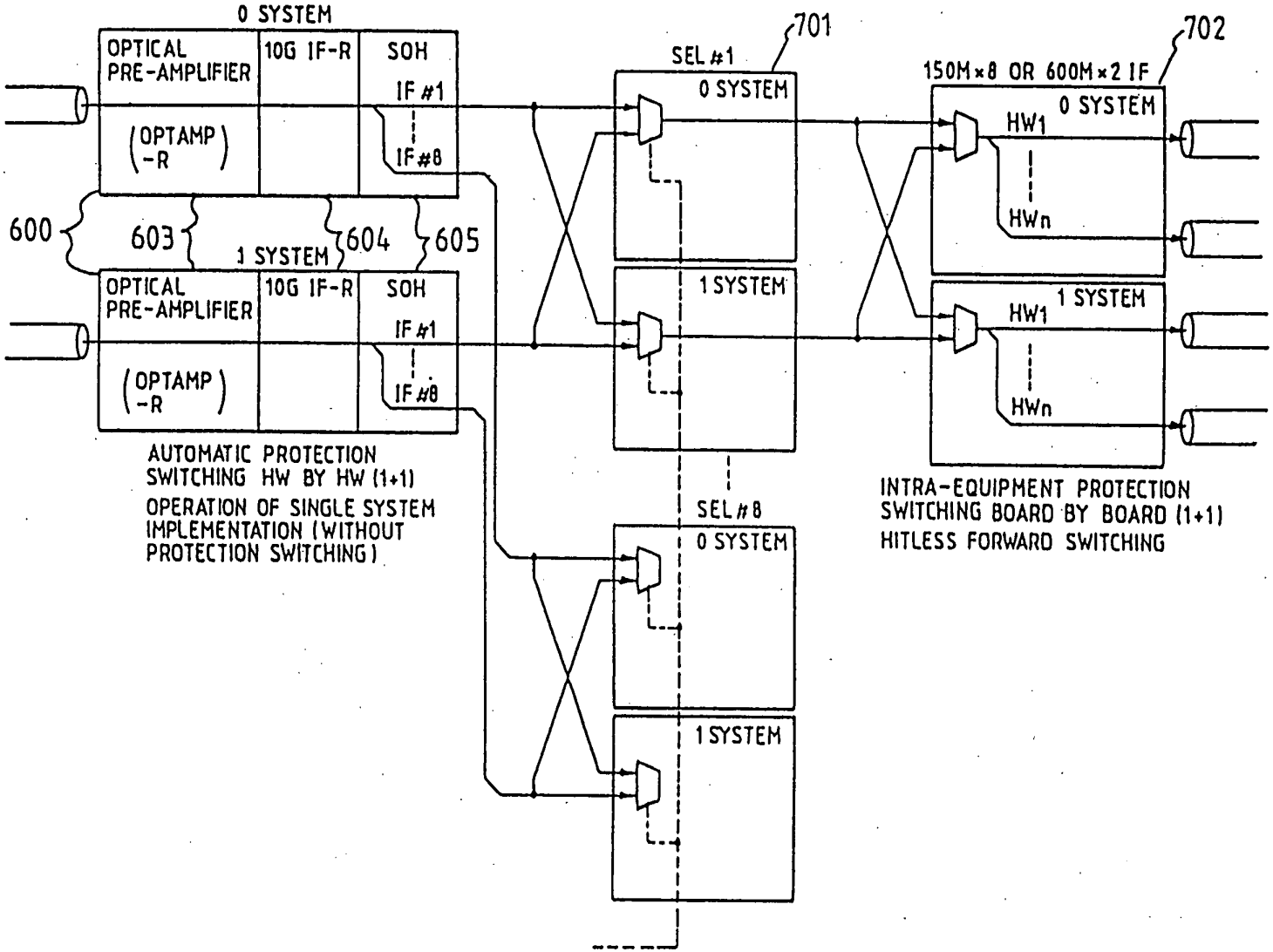

0 SYSTEM
OPTICAL PRE-AMPLIFIER
10G IF-R
SOH
IF #1
IF #8
(OPTAMP -R)
600
603
1 SYSTEM
604
605
701
SEL #1
0 SYSTEM
1 SYSTEM
SEL #8
0 SYSTEM
1 SYSTEM
AUTOMATIC PROTECTION SWITCHING HW BY HW (1+1)
OPERATION OF SINGLE SYSTEM IMPLEMENTATION (WITHOUT PROTECTION SWITCHING)
702
150M×8 OR 600M×2 IF
0 SYSTEM
HW1
HWn
1 SYSTEM
HW1
HWn
INTRA-EQUIPMENT PROTECTION SWITCHING BOARD BY BOARD (1+1)
HITLESS FORWARD SWITCHING

FIG. 35

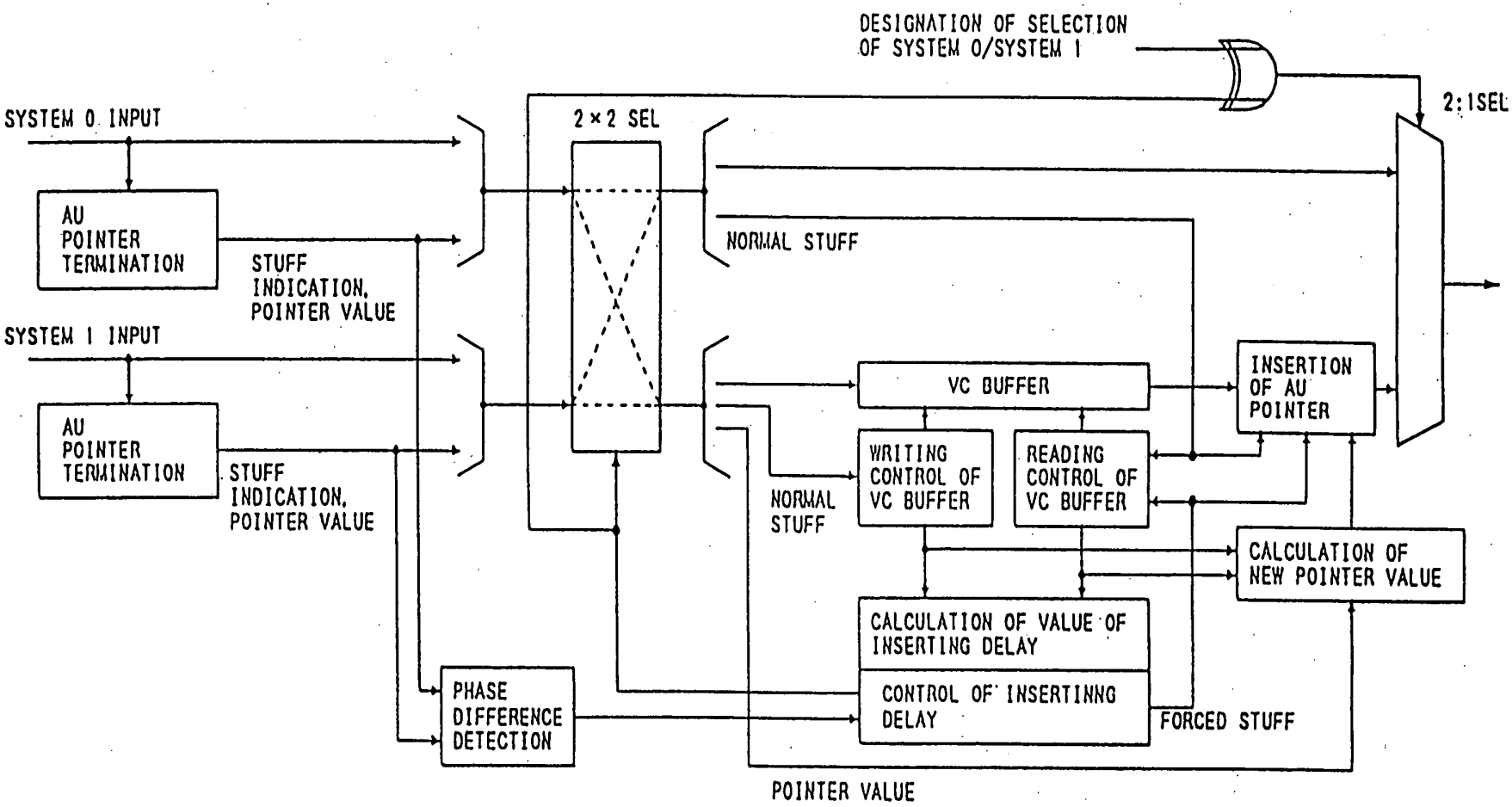
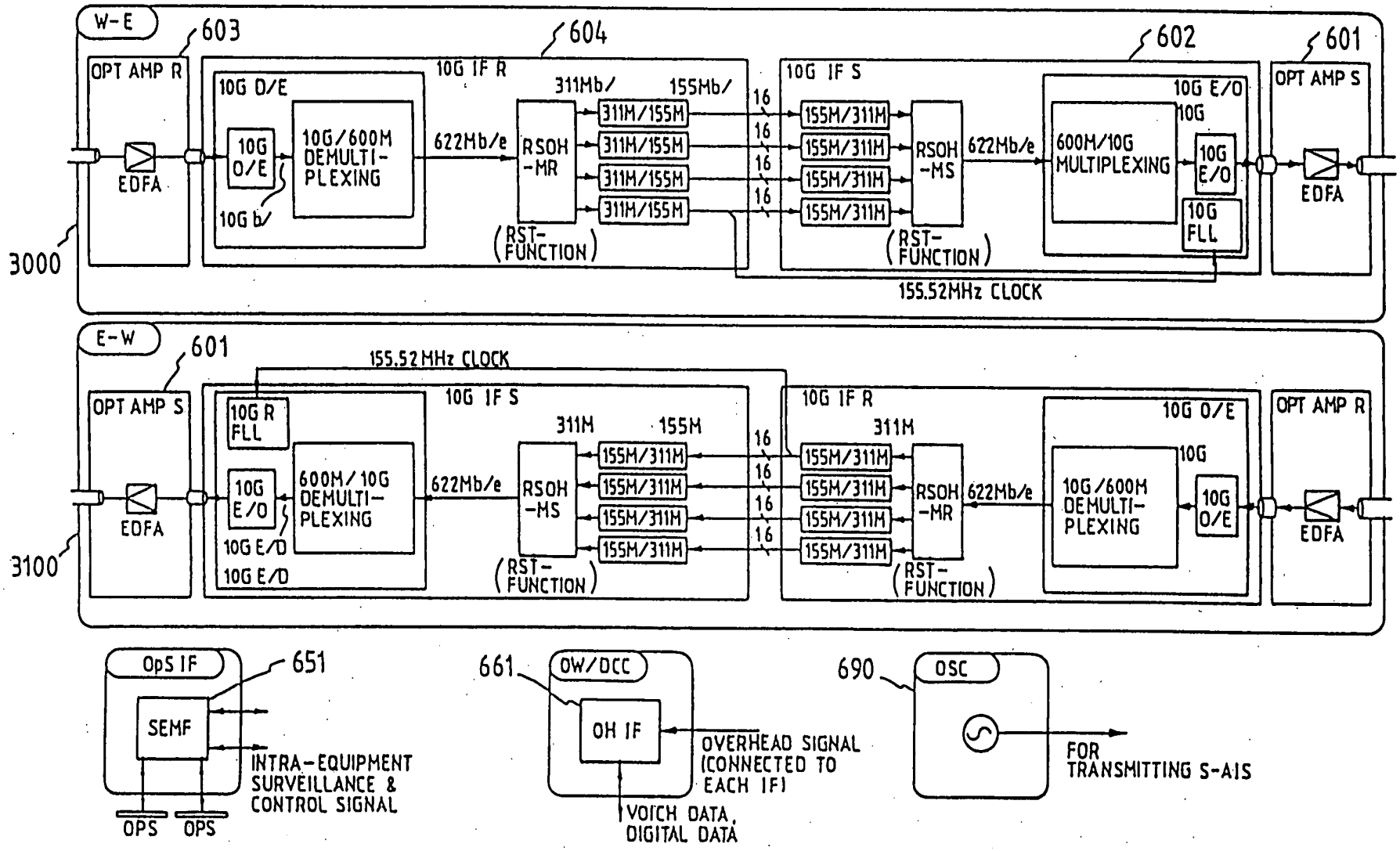

DESIGNATION OF SELECTION OF SYSTEM 0/SYSTEM 1
2:1SEL
SYSTEM 0 INPUT
2×2 SEL
AU POINTER TERMINATION
STUFF INDICATION, POINTER VALUE
NORMAL STUFF
SYSTEM 1 INPUT
VC BUFFER
INSERTION OF AU POINTER
AU POINTER TERMINATION
STUFF INDICATION, POINTER VALUE
WRITING CONTROL OF VC BUFFER
READING CONTROL OF VC BUFFER
NORMAL STUFF
CALCULATION OF NEW POINTER VALUE
CALCULATION OF VALUE OF INSERTING DELAY
PHASE DIFFERENCE DETECTION
CONTROL OF INSERTINNG DELAY
FORCED STUFF
POINTER VALUE

FIG. 36


W-E
603
604
602
601
OPT AMP R
10G O/E
10G IF R
10G IF S
10G E/O
OPT AMP S
EDFA
10G O/E
10G/600M DEMULTI-PLEXING
622Mb/e
RSOH -MR
311Mb/
155Mb/
311M/155M
16
155M/311M
RSOH -MS
600M/10G MULTIPLEXING
10G E/O
10G FLL
(RST-FUNCTION)
155.52MHz CLOCK
3000
E-W
601
155.52MHz CLOCK
OPT AMP S
10G R FLL
10G IF S
10G IF R
311M
155M
10G O/E
OPT AMP R
10G E/O
600M/10G DEMULTI-PLEXING
10G/600M DEMULTI-PLEXING
3100
OpS IF
651
SEMF
INTRA-EQUIPMENT SURVEILLANCE & CONTROL SIGNAL
OPS
661
OW/DCC
OH IF
OVERHEAD SIGNAL (CONNECTED TO EACH IF)
VOICH DATA, DIGITAL DATA
690
OSC
FOR TRANSMITTING S-AIS

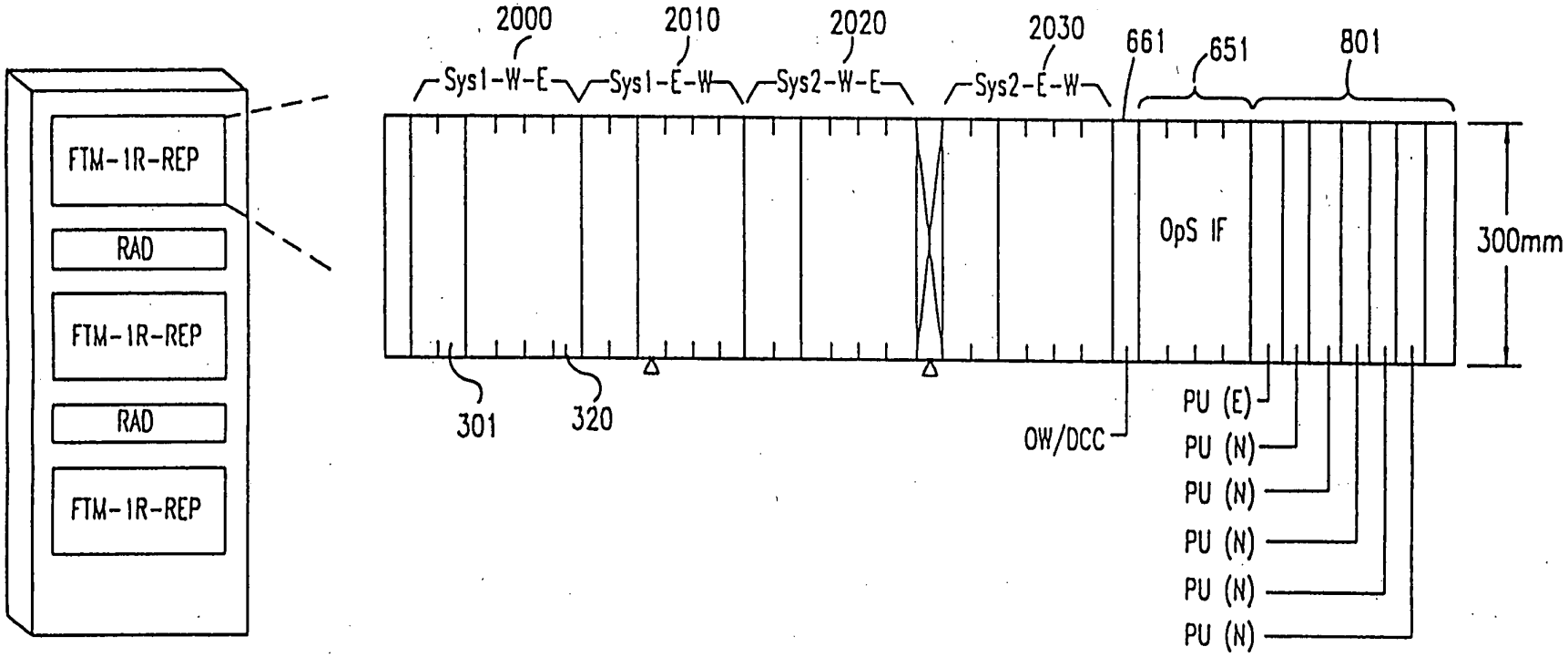
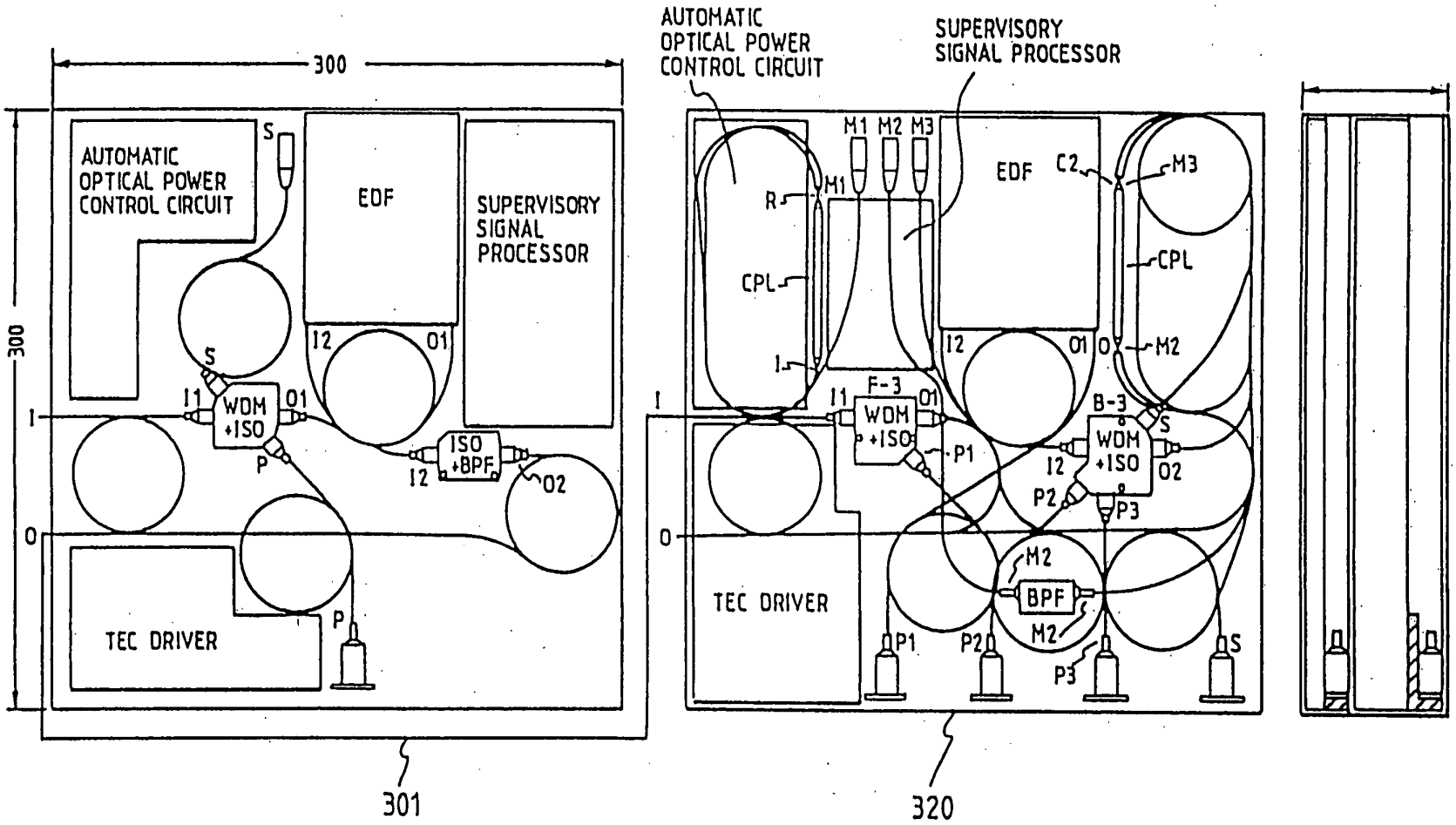

FTM-1R-REP
RAD
FTM-1R-REP
RAD
FTM-1R-REP
2000
2010
2020
2030
661
651
801
Sys1-W-E
Sys1-E-W
Sys2-W-E
Sys2-E-W
OpS IF
300mm
301
320
OW/DCC
PU (E)
PU (N)
PU (N)
PU (N)
PU (N)
PU (N)

FIG.37

FIG. 38


300
AUTOMATIC OPTICAL POWER CONTROL CIRCUIT
EDF
SUPERVISORY SIGNAL PROCESSOR
S
I2
O1
I1
WDM +ISO
O1
P
ISO +BPF
I2
O2
TEC DRIVER
P
300
1
0
301
AUTOMATIC OPTICAL POWER CONTROL CIRCUIT
SUPERVISORY SIGNAL PROCESSOR
M1 M2 M3
R
M1
CPL
1
EDF
C2
M3
CPL
I2
O1
O
M2
I1
F-3
O1
WDM +ISO
P1
B-3
S
WDM +ISO
O2
I2
P2
P3
M2
BPF
M2
TEC DRIVER
P1
P2
P3
S
1
0
320

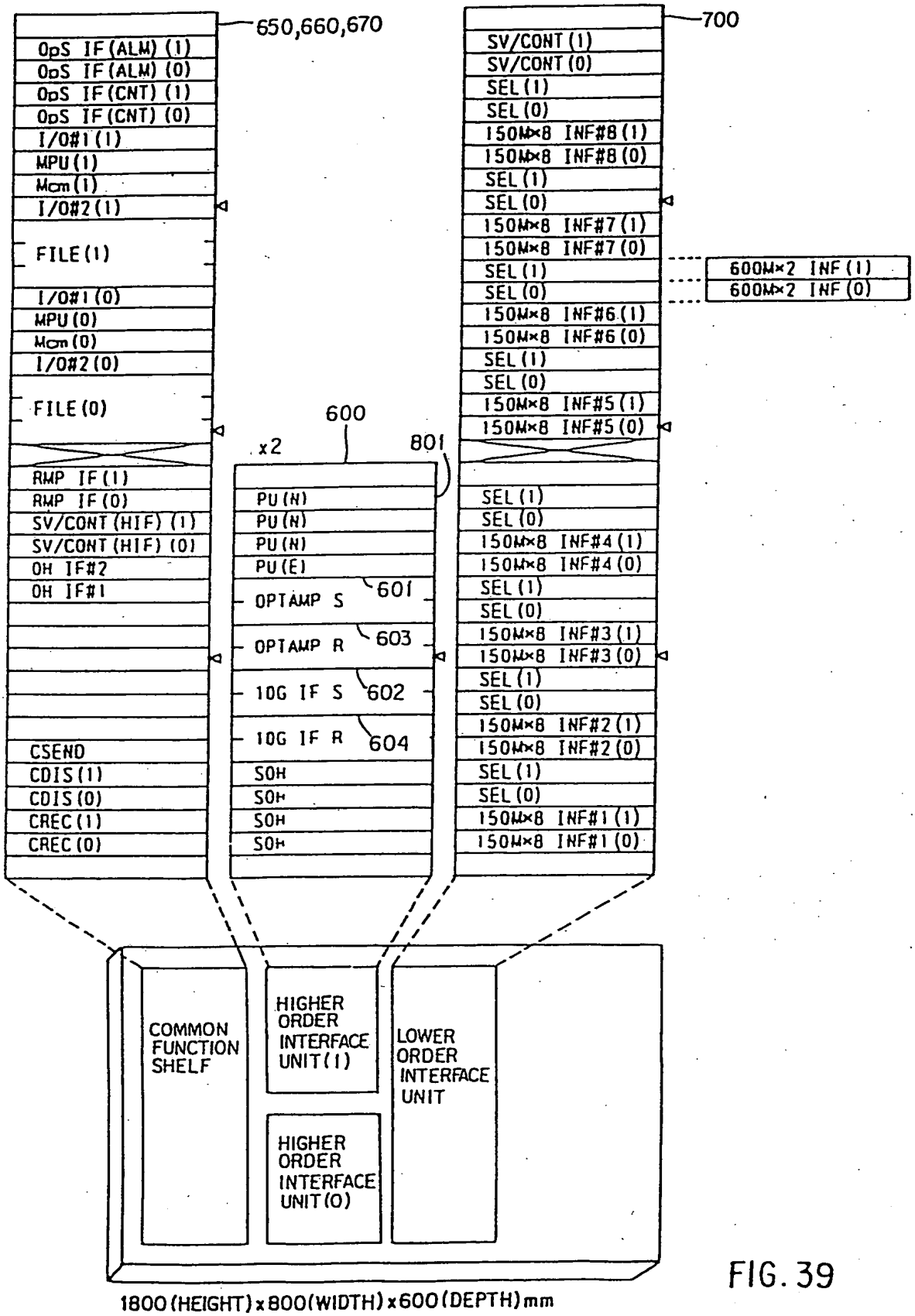

650,660,670
OpS IF(ALM)(1)
OpS IF(ALM)(0)
OpS IF(CNT)(1)
OpS IF(CNT)(0)
I/O#1(1)
MPU(1)
Mem(1)
I/O#2(1)
FILE(1)
I/O#1(0)
MPU(0)
Mem(0)
I/O#2(0)
FILE(0)
RMP IF(1)
RMP IF(0)
SV/CONT(HIF)(1)
SV/CONT(HIF)(0)
OH IF#2
OH IF#1
CSEND
CDIS(1)
CDIS(0)
CREC(1)
CREC(0)
600
x2
801
PU(N)
PU(N)
PU(N)
PU(E)
OPTAMP S
601
OPTAMP R
603
10G IF S
602
10G IF R
604
SOH
SOH
SOH
SOH
700
SV/CONT(1)
SV/CONT(0)
SEL(1)
SEL(0)
150M×8 INF#8(1)
150M×8 INF#8(0)
SEL(1)
SEL(0)
150M×8 INF#7(1)
150M×8 INF#7(0)
SEL(1)
SEL(0)
150M×8 INF#6(1)
150M×8 INF#6(0)
SEL(1)
SEL(0)
150M×8 INF#5(1)
150M×8 INF#5(0)
SEL(1)
SEL(0)
150M×8 INF#4(1)
150M×8 INF#4(0)
SEL(1)
SEL(0)
150M×8 INF#3(1)
150M×8 INF#3(0)
SEL(1)
SEL(0)
150M×8 INF#2(1)
150M×8 INF#2(0)
SEL(1)
SEL(0)
150M×8 INF#1(1)
150M×8 INF#1(0)
600M×2 INF(1)
600M×2 INF(0)
COMMON FUNCTION SHELF
HIGHER ORDER INTERFACE UNIT(1)
HIGHER ORDER INTERFACE UNIT(0)
LOWER ORDER INTERFACE UNIT
1800(HEIGHT)×800(WIDTH)×600(DEPTH)mm

FIG. 39

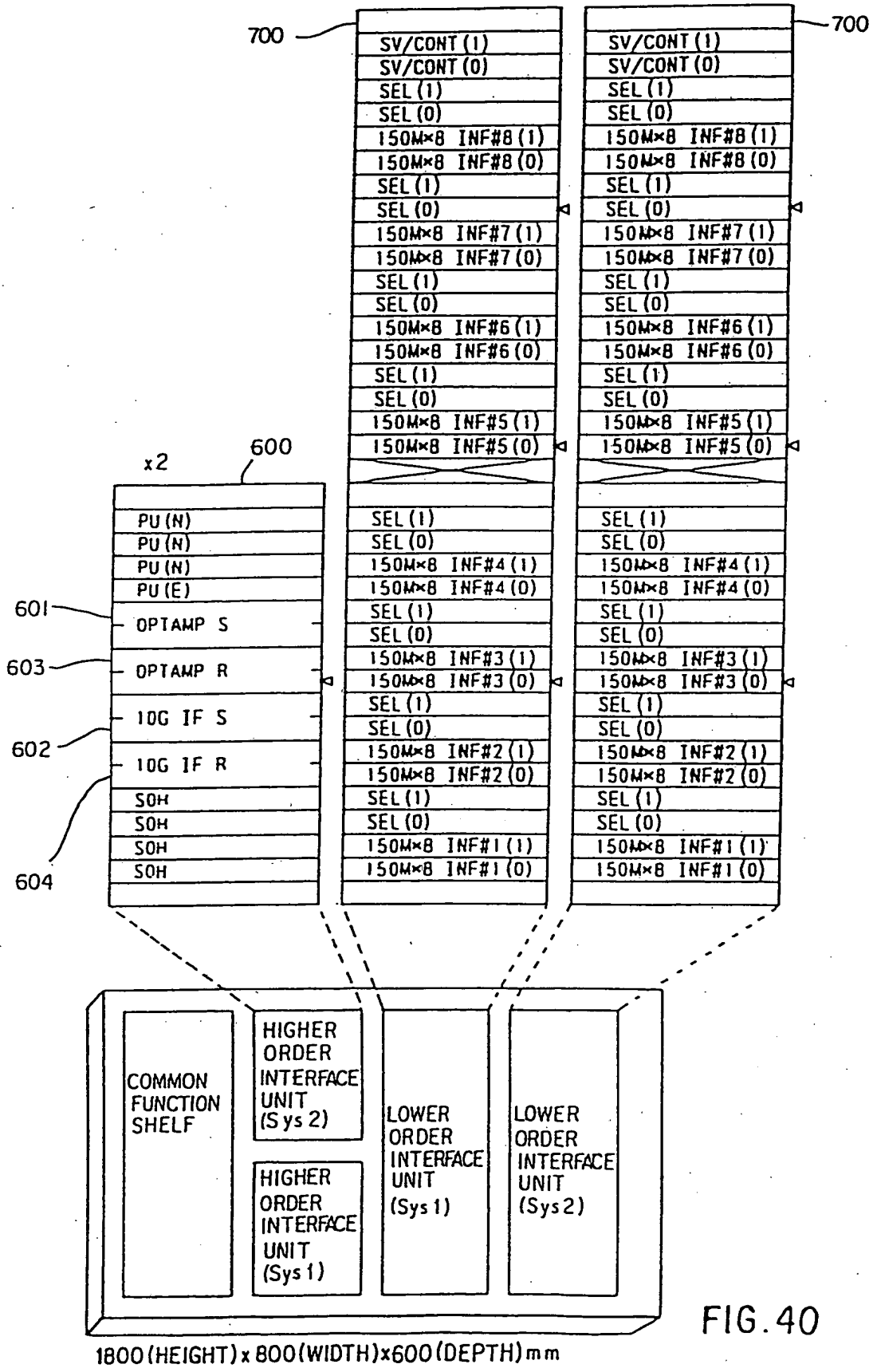

700
700
SV/CONT (1)
SV/CONT (0)
SEL (1)
SEL (0)
150M×8 INF#8 (1)
150M×8 INF#8 (0)
150M×8 INF#7 (1)
150M×8 INF#7 (0)
150M×8 INF#6 (1)
150M×8 INF#6 (0)
150M×8 INF#5 (1)
150M×8 INF#5 (0)
150M×8 INF#4 (1)
150M×8 INF#4 (0)
150M×8 INF#3 (1)
150M×8 INF#3 (0)
150M×8 INF#2 (1)
150M×8 INF#2 (0)
150M×8 INF#1 (1)
150M×8 INF#1 (0)
x2
600
PU (N)
PU (N)
PU (N)
PU (E)
601
OPTAMP S
603
OPTAMP R
10G IF S
602
10G IF R
SOH
SOH
SOH
SOH
604
COMMON FUNCTION SHELF
HIGHER ORDER INTERFACE UNIT (Sys 2)
HIGHER ORDER INTERFACE UNIT (Sys 1)
LOWER ORDER INTERFACE UNIT (Sys 1)
LOWER ORDER INTERFACE UNIT (Sys 2)
1800 (HEIGHT) x 800 (WIDTH) x 600 (DEPTH) mm

FIG. 40

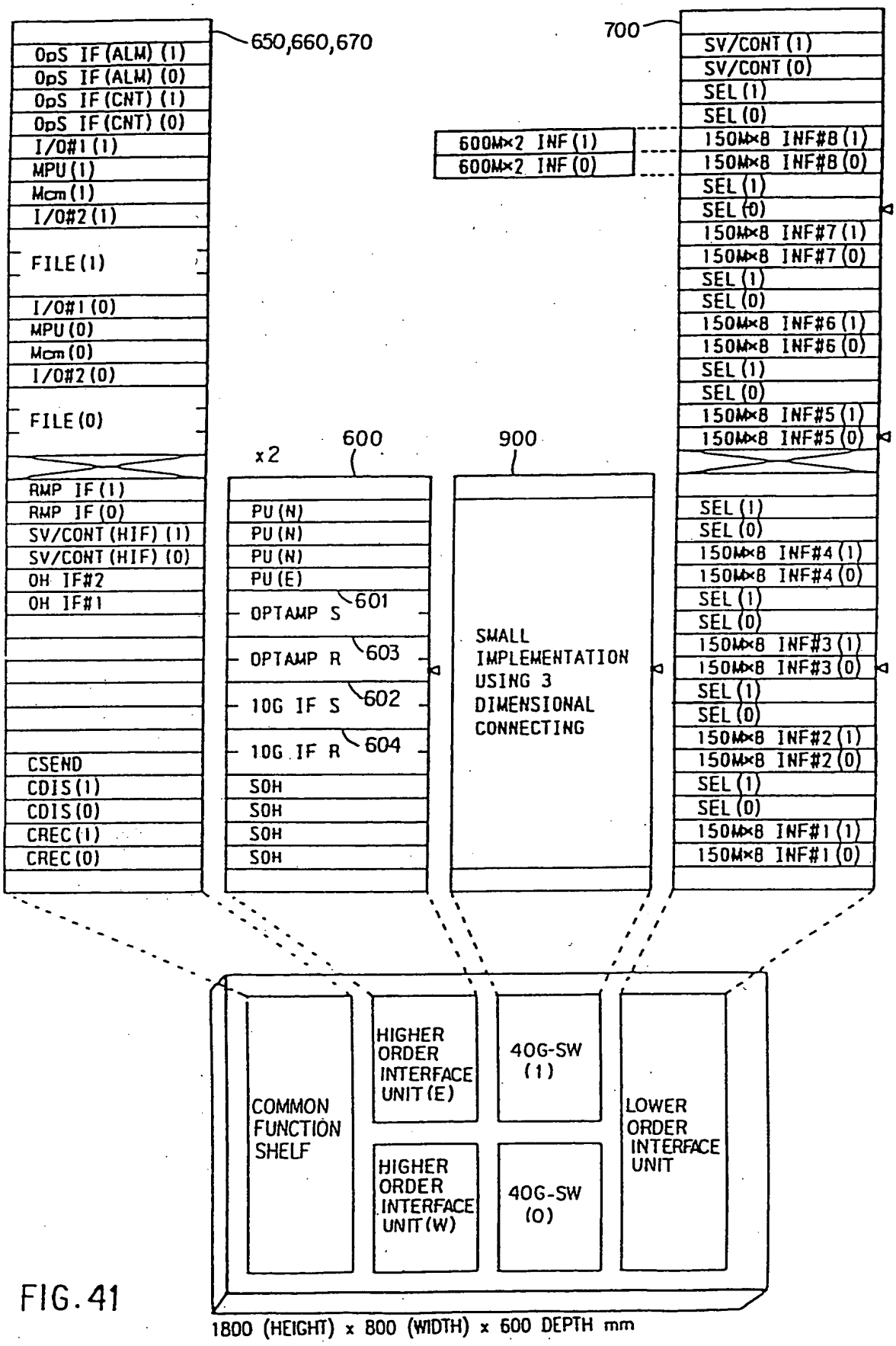
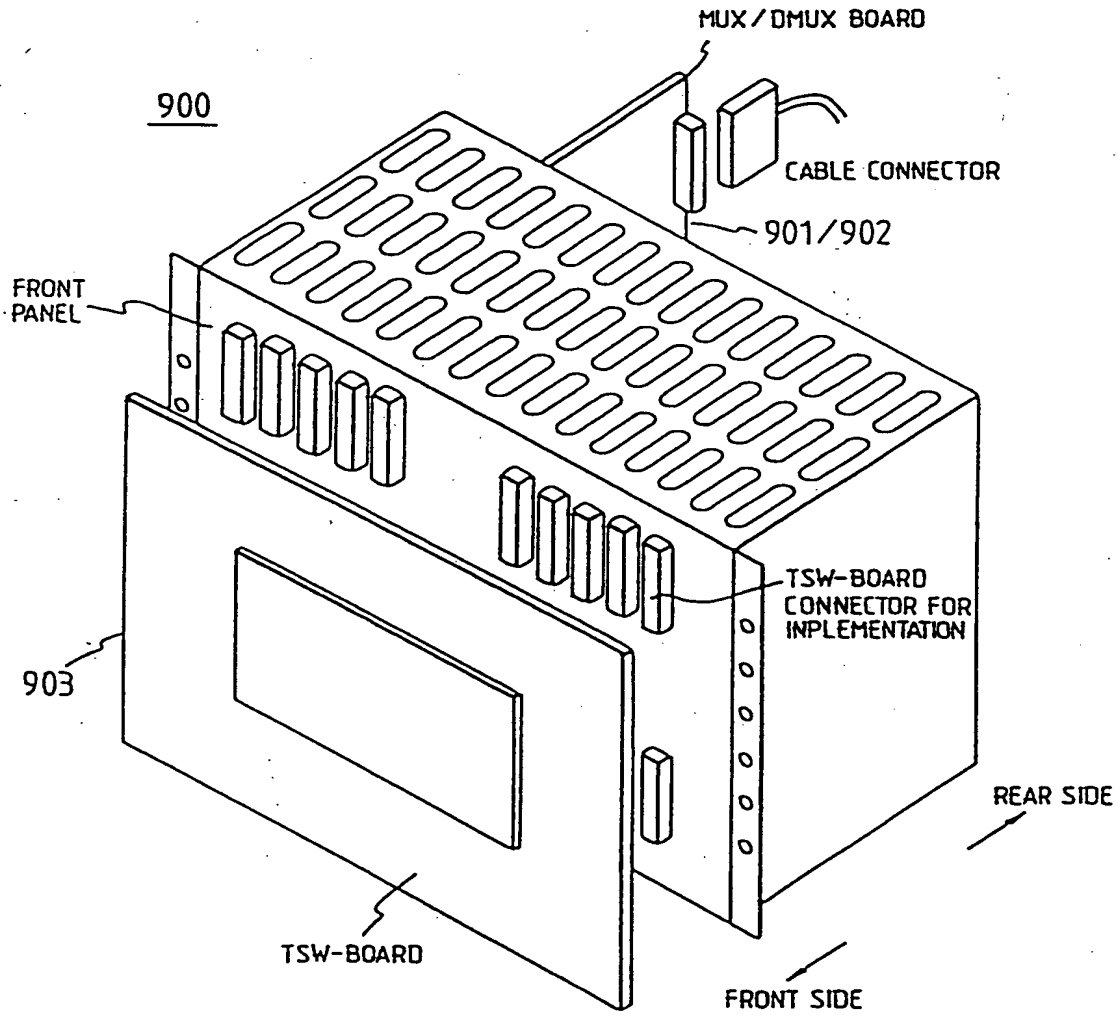

650,660,670
700
OpS IF(ALM)(1)
OpS IF(ALM)(0)
OpS IF(CNT)(1)
OpS IF(CNT)(0)
I/O#1(1)
MPU(1)
Mem(1)
I/O#2(1)
FILE(1)
I/O#1(0)
MPU(0)
Mem(0)
I/O#2(0)
FILE(0)
RMP IF(1)
RMP IF(0)
SV/CONT(HIF)(1)
SV/CONT(HIF)(0)
OH IF#2
OH IF#1
CSEND
CDIS(1)
CDIS(0)
CREC(1)
CREC(0)
x2
600
PU(N)
PU(N)
PU(N)
PU(E)
OPTAMP S
601
OPTAMP R
603
10G IF S
602
10G IF R
604
SOH
SOH
SOH
SOH
900
SMALL IMPLEMENTATION USING 3 DIMENSIONAL CONNECTING
SV/CONT(1)
SV/CONT(0)
SEL(1)
SEL(0)
600M×2 INF(1)
600M×2 INF(0)
150M×8 INF#8(1)
150M×8 INF#8(0)
SEL(1)
SEL(0)
150M×8 INF#7(1)
150M×8 INF#7(0)
SEL(1)
SEL(0)
150M×8 INF#6(1)
150M×8 INF#6(0)
SEL(1)
SEL(0)
150M×8 INF#5(1)
150M×8 INF#5(0)
SEL(1)
SEL(0)
150M×8 INF#4(1)
150M×8 INF#4(0)
SEL(1)
SEL(0)
150M×8 INF#3(1)
150M×8 INF#3(0)
SEL(1)
SEL(0)
150M×8 INF#2(1)
150M×8 INF#2(0)
SEL(1)
SEL(0)
150M×8 INF#1(1)
150M×8 INF#1(0)
COMMON FUNCTION SHELF
HIGHER ORDER INTERFACE UNIT(E)
HIGHER ORDER INTERFACE UNIT(W)
40G-SW (1)
40G-SW (0)
LOWER ORDER INTERFACE UNIT
1800 (HEIGHT) x 800 (WIDTH) x 600 DEPTH mm

FIG. 41

FIG. 42


MUX/DMUX BOARD
900
CABLE CONNECTOR
901/902
FRONT PANEL
TSW-BOARD CONNECTOR FOR INPLEMENTATION
903
REAR SIDE
TSW-BOARD
FRONT SIDE

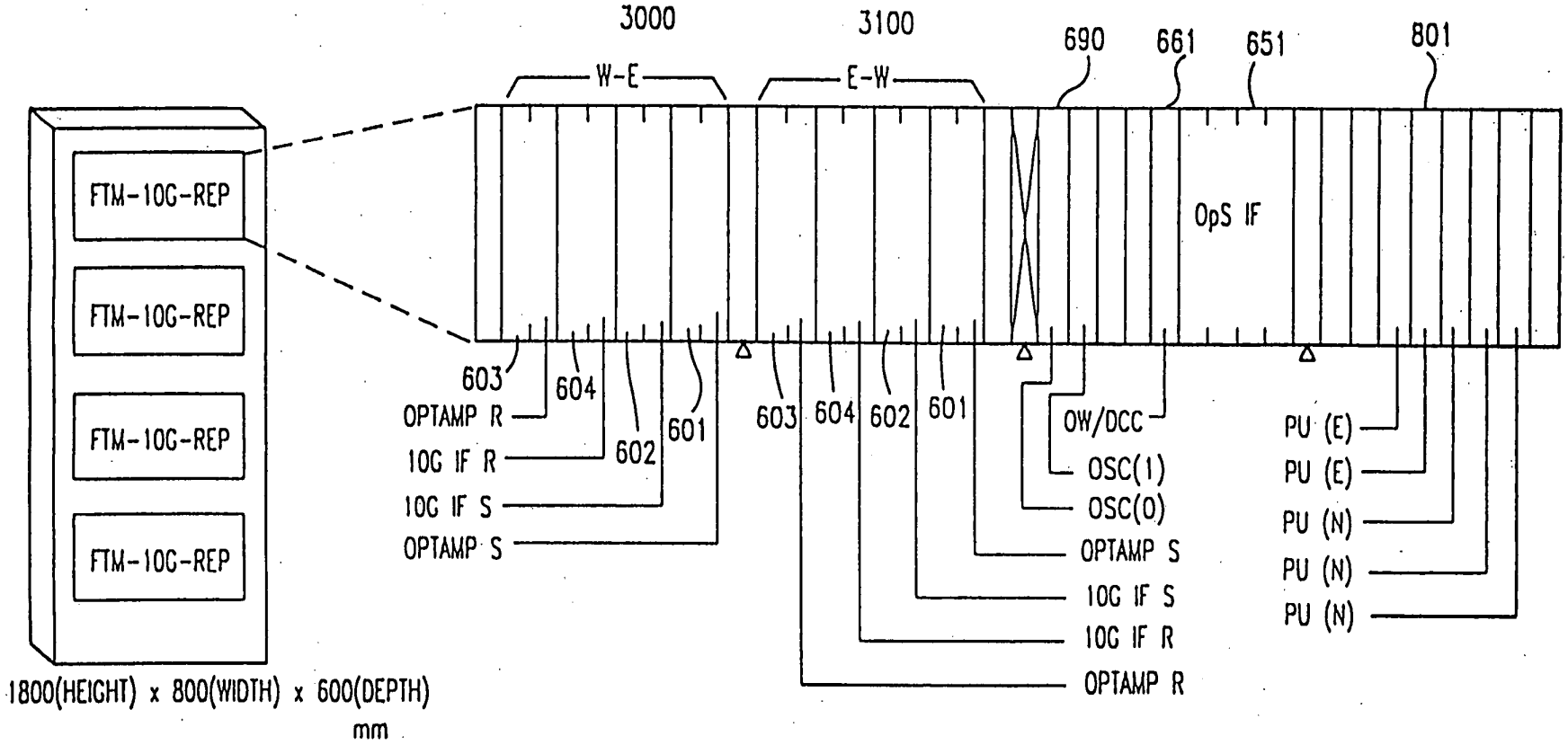

3000
3100
690
661
651
801
W-E
E-W
FTM-10G-REP
FTM-10G-REP
FTM-10G-REP
FTM-10G-REP
OpS IF
603
604
602
601
OPTAMP R
10G IF R
10G IF S
OPTAMP S
603
604
602
601
OW/DCC
OSC(1)
OSC(0)
OPTAMP S
10G IF S
10G IF R
OPTAMP R
PU (E)
PU (E)
PU (N)
PU (N)
PU (N)
1800(HEIGHT) x 800(WIDTH) x 600(DEPTH)
mm

FIG.44

FIG. 43(a)

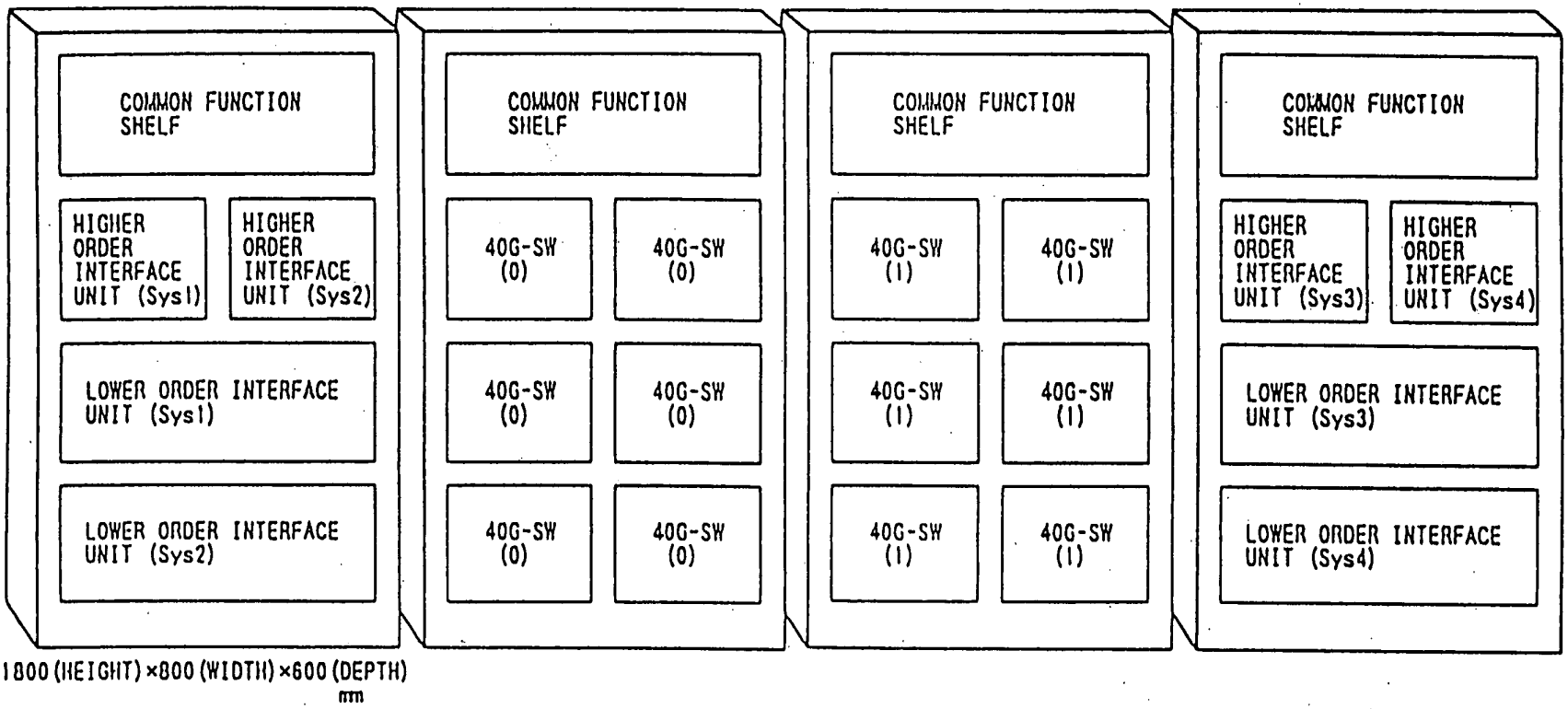
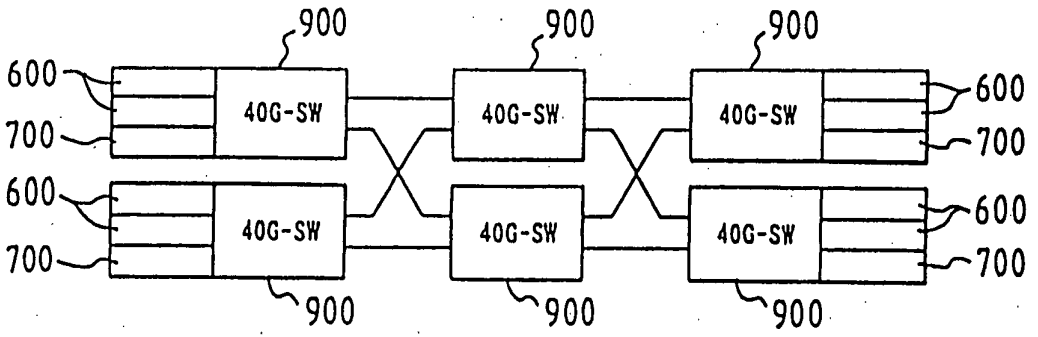



FIG. 43(b)